



WOLKITE UNIVERSITY

COLLEGE OF COMPUTING AND INFORMATICS

DEPARTMENT OF COMPUTER SCIENCE

PROJECT TITLE

**FINGER PRINT BASED VOTING SYSTEM FOR WKU
STUDENT UNION**

BY

NAME	ID
1. YAYAL ABAYNEH	CIR/073/10
2. WORKU BAYU	CIR/072/10
3. KELEM BELAY	CIR/040/10

PROJECT ADVISOR: TESFAHUN NURRIE (MSc)

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STUDENT UNION

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NAME	ID
1. YAYAL ABAYNEH	CIR/073/10
2. WORKU BAYU	CIR/072/10
3. KELEM BELAY	CIR/040/10

PROJECT ADVISOR: TESFAHUN NURRIE (MSc)

Wolkite University, Wolkite Ethiopia

August 23, 2021

DECLARATION

This is to declare that this project work which is done under the supervision of **Tesfahun Nurrie (MSc)** and having the title **Finger print based voting system for wku student union** is the sole contribution of: Yayal Abayneh, Worku Bayu and Kelem Belay No part of the project work has been reproduced illegally (copy and paste) which can be considered as Plagiarism. All referenced parts have been used to argue the idea and have been cited properly. We will be responsible and liable for any consequence if violation of this declaration is proven.

Date: _____

Group Members:

Full Name

Signature

1. Yayal Abayneh

2. Worku Bayu

3. Kelem Belay

Approval Form

This is to confirm that the project report entitled **Finger print based voting system for WKU student union** submitted to Wolkite University, College of Computing and Informatics Department of computer science by: Yayal Abayneh, Worku Bayu and Kelem Belay is approved for submission.

Advisor Name

Signature

Date

Department Head Name

Signature

Date

Examiner 1 Name

Signature

Date

Examiner 2 Name

Signature

Date

Examiner 3 Name

Signature

Date

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Table of Contents

Exclusive summery	iv
CHAPTER ONE	1
1. INTRODUCTION	1
1.1. Background of the Organization.....	2
1.2. Statement of the Problem.....	2
1.3 Objectives of the Project.....	3
1.3.1. General Objective	3
1.3.2. Specific Objectives	3
1.4 Feasibility Analysis.....	3
1.4.1. Technical Feasibility.....	4
1.4.2. Operational Feasibility.....	4
1.4.3. Economic Feasibility	4
1.5. Scope and Limitation of the project.....	4
1.5.1. Scope of the project	4
1.5.2. Limitation of the Project	4
1.6. Significance of the Project	5
1.7. Beneficiary of the Project	5
1.8. Methodology of the Project	6
1.8.1. Data Collection Tools/Techniques.....	6
1.8.2. System Analysis and Design.....	7
1.8.3. System Development Model.....	7
1.8.4. System Testing Methodology	7

1.8.4.1. Unit Testing	7
1.8.4.2. Integration Testing	8
1.8.4.3. System Testing.....	8
1.8.5. Development Tools and Technologies	8
1.8.5.1 Frontend Technologies	8
1.8.5.2. Backend Technologies	8
1.8.5.3. Documentation and Modeling Tools	9
1.8.5.4. Deployment Environment.....	9
1.9 Document organization	9
CHAPTER TWO	11
2. DESCRIPTION OF THE EXISTING SYSTEM	11
2.1 INTRODUCTION TO THE EXISTING SYSTEM.....	11
2.2 Users of the existing system	12
2.3 Major function of the existing system	13
2.4 Forms and other documents of the existing system.....	14
2.5 Draw backs of the existing system	17
2.6 Business rules of the existing system	18
CHAPTER THREE	20
3 PROPOSED SYSTEM	20
3.1. Functional Requirements	20
3.2. Non-functional Requirements.....	23
3.2.1. User Interface and Human Factors	23
3.2.2. Hardware Consideration	23
3.2.3. Security Issues	24

3.2.4. Performance Consideration.....	24
3.2.5. Error Handling and Validation	25
3.2.6. Quality Issues.....	25
3.2.7. Backup and Recovery	25
3.2.8. Physical Environment	26
3.2.9. Resource Issues	26
3.2.10. Documentation.....	26
CHAPTER FOUR.....	27
4. SYSTEM ANALYSIS	27
4.3. System Model	27
4.3.1. Use Case Model	27
4.3.1.1. Use Case Diagram	28
4.3.1.2. Use Case Description.....	32
4.3.1.3. Use case Scenario	51
4.4. Object Model	55
4.4.1. Class Diagram.....	55
4.4.2. Data Dictionary	56
4.5. Dynamic Model	60
4.5.1. Sequence Diagram	60
4.5.2. Activity Diagram	65
4.5.3 State chart Diagram	69
CHAPTER FIVE	72
5. SYSTEM DESIGN	72
5.1. Design Goals.....	72

5.2. Current system architecture	73
5.3. Proposed System Architecture	74
5.3.1. Subsystem Decomposition and Description	75
5.3.2. Hardware/Software Mapping.....	78
5.3.4. Detailed Class Diagram	79
5.3.5. Persistent Data Management	81
5.3.6. Access Control and Security.....	83
5.4. Packages.....	83
5.5. Algorithm Design	85
5.6. User Interface Design	87
CHAPTER SIX.....	89
6. IMPLEMENTATION AND TESTING	89
6.1. Implementation of the Database	89
6.2. Implementation of the class diagram	89
6.3. Configuration of the application server	89
6.4. Configuration of application security	90
6.5. Implementation of user interface	90
6.6. Testing the system	90
6.6.2. Testing tools and Environments	91
6.6.3. Unit testing.....	92
6.6.4. System testing.....	92
6.6.5. Integration testing	92
6.6.6. Acceptance testing	93
CHAPTER SEVEN	94

7. CONCLUSION AND RECOMMENDATION.....	94
7.1. Conclusion	94
7.2. Recommendation	94
Reference	95

List of Table

Table 4. 1 registration use case description.....	32
Table 4. 2 login use case description.....	34
Table 4. 3 mangling use case description.....	35
Table 4. 4 post announcement use case description.....	37
Table 4. 5 evaluation use case description	38
Table 4. 6 voting day scheduling use case description	40
Table 4. 7 running campaign use case description.....	42
Table 4. 8 view post use case description	43
Table 4. 9 view profile use case description	44
Table 4. 10 voting use case description.....	45
Table 4. 11 view result use case description	47
Table 4. 12 report complain use case description	48
Table 4. 13 response complain use case description.....	49
Table 4. 14 data dictionary of election committee	56
Table 4. 15 data dictionary of candidate	57
Table 4. 16 data dictionary of vote.....	57
Table 4. 17 data dictionary of announcement	58
Table 4. 18 data dictionary of announcement	58
Table 4. 19 data dictionary of account	59
Table 5. 1 Access Control and Security table	83

List of figure

Figure 2. 1 Announcement from	14
Figure 2. 2 evaluation form	15
Figure 2. 3 guideline form.....	16
Figure 2. 4 existing system work flow	19
Figure 4. 1 voting system use case diagram	28
Figure 4. 2 Admin use case diagram	29
Figure 4. 3 Election committee use case diagram	30
Figure 4. 4 candidate use case diagram.....	31
Figure 4. 5 voter use case diagram	31
Figure 4. 6 class diagram.....	55
Figure 4. 7 login sequence diagram	60
Figure 4. 8 registration sequence diagram.....	61
Figure 4. 9 voting sequence diagram.....	62
Figure 4. 10 announcement sequences diagram.....	63
Figure 4. 11 Comment Sequences diagram.....	64
Figure 4. 12 login activity diagram	65
Figure 4. 13 mange user activity diagram	66
Figure 4. 14 vote activity diagram	67
Figure 4. 15 announcement activity diagram	68
Figure 4. 16 login stat chart diagram.....	69
Figure 4. 17 registration state chart diagram.....	70
Figure 4. 18 vote state chart diagram	71
Figure 5. 1 Proposed System Architecture diagram	74
Figure 5. 2 Subsystem Decomposition and Description diagram	77
Figure 5. 3 Hardware/Software Mapping diagram.....	78
Figure 5. 4 detail class diagram.....	80
Figure 5. 5 Persistent Data Management diagram	82

Figure 5. 6 Packages diagram.....84

Figure 5. 7 Home Page User Interface Design.....87

Figure 5. 8 Login Page User Interface Design88

Lists of abbreviations

CCI	College of Computing and Informatics
CGPA	Cumulative Grade Point Average
CPU	Central Processing Unit
CRU	Create Read Update
CRUD	Create Read Update Delete
CSS	Cascading Style Sheet
G.C	Gregorian Calendar
GPA	Grade Point Average
HTML	Hypertext Markup Language
https	Hypertext Transfer Protocol Secure
ID	Identification
IOS	iPhone Operating System
km	Kilo meters
MD5	Message Digest 5
MSHE	Ministry of Science and Higher Education
MVT	Model View Template
R	Read

SQL	Structural Query Language
SU	Student Union
UCN	Use Case Number
UI	User Interface
UID	User Identification
UML	Unified Modeling Language
WKU	Wolkite University

Executive summary

Each Universities in Ethiopia has their own student union (SU). This student union's helps the students and the university community to accelerate the learning and teaching process peacefully.[1] The election of president to this powerful group needs democratic and formal process by which Voters votes their representative during election to lead them. Manual election process has so many drawbacks such as one voter may vote more than one candidate at a time, one voter may add more than one card to one candidate, may unauthorized voter votes, time and resource consuming, data retrieving is hard, insecure and others. So in order to solve the above problem we are developing fingerprint based voting system for WKU student union president vote. In our approach we have two level of security in voting process. The first level is the verification of unique ID number (UID) and password, second level is fingerprint. To develop this system we use iterative software development model and we are developing the system by using python language with Django framework for web part and android studio for android part. When the election problem mention above is solved the expenditure of an election will be decreased, the voting will be democratic and fair and students will vote at everywhere in a given time interval. It will be a facility for the voter who have different problems that affects voter participation on election process due to manual work such as mentioned earlier.

CHAPTER ONE

1. INTRODUCTION

A student union, or association, or another name it may come under, is a student-run group that dedicates its time and resources to give the whole student community of the university, fairness, opportunities and a voice.[2] Each Universities in Ethiopia has their own student union (SU). This student union's helps the students and the university community to accelerate the learning and teaching process peacefully[1]. SU is the most important and crucial things to request the proper academic question of students to the respective author and improve student facility problems of them like academic case, cafeteria, library, dormitory problem, shopping area problem, student lounges and others. The student union has periodical election process of electing the student's president. The election of president to this powerful group needs democratic and formal process by which Voters votes their representative during election to lead them. But the existing manual election process has so many drawbacks such as one voter may vote more than one candidate at the time, one voter may add more than one card to one candidate, may unauthorized voter votes, time and resource consuming, data retrieving is hard, insecure and others.

One of the major factors to be taken care of in a voting process is authentication and authorization of voters. Many conditions need to be checked to ensure these factors. Major conditions include: - Check authenticity of voter, Authorize legitimate voters to vote and avoid double vote of any individual. Checking all these conditions manually is a very complicated and exhausting task with many chances of human error. To avoid this we are developing a fingerprint based voting system.

Security and privacy are the main concerns for voting. From that point of view, we will implement the voting system with fingerprint recognition. In this system fingerprint detection and recognition concept is use to identify the exact person that who are vote. There are two levels of verification we use for the voters in this voting system. The first one is unique ID and password verification and the second of security which is the main security level where the system recognize the biometric of the real voter from the current database of fingerprint given by the election commission.

When the problem above solved the expenditure of an election will be decreased and students will vote at everywhere. It will be a facility for the student who have different problems such as mentioned earlier

1.1. Background of the Organization

Wolkite University is among the ten third generation universities established in 2011 G.C. the University is located at Wolkite town in Gurage zone that is located 155 km from Addis Ababa. However, during establishing the university had three colleges and thirteen departments currently there are seven colleges, one school and about forty-eight departments[3].

As higher education institution besides of teaching learning, participation on research, projects and community services on the major identified prioritize problem areas are the concerns of university. The University gives educational services for regular students as well as extension programs for the people who live in Wolkite town, neighboring cities and other parts of the country. The University aspires to be one of the top ten universities among East Africa universities 2027 with good foundation and best opportunities.

In the University there are different management activities that are performed. Among those activities Wolkite University Student Union Voting system is one of the major activity. In this activity there is a problem associated voting. So the team initiated with the help of university to identify and analyses those problems and to develop fully automated voting system with finger print based authentication in order to achieve their great vision.

1.2. Statement of the Problem

The current Student Union (SU) in WKU uses the manual or paper based election process to elect the president of the Union. All the election process are performing in manual system. The registration of nominees, the voters, the election commission and campaigning, notification and announcements are paper-based systems in the WKU Student Union voting system process. Manual election process has so many drawbacks such as time and resource consuming, vulnerable to double voting and bribing. The problems are-

- It has the problem of double voting because one voter may use many voting cards and give for a single candidate; and may give for different candidates.
- Unauthorized voters may vote.
- The existing voting system is insecure system.
- The current election system consume more resource.
- Data retrieving mechanism in the current system is so hard.

- Most voters vacillate to vote because the existing system lacks flexibility.
- The existing system doesn't have communication channels between the candidates, election committee and students.
- The existing system do not participate all students it allows only for class representatives and other authorized persons.

1.3 Objectives of the Project

1.3.1. General Objective

The main objective of this project is to design and develop finger print based WKU student union voting system.

1.3.2. Specific Objectives

- Identifying all problems of the manual system
- Reviewing the existing/current voting process or approach of student Union.
- Requirement gathering under the manual system
- Analyzing the gathered requirement.
- Design the proposed system based on the gathered requirement and the university infrastructure.
- Implementation of the proposed system.
- Test and evaluate the proposed system using software testing mechanisms
- validating the system to ensure that only legible voters allow to vote.
- Draw conclusion and recommendation
- Coming up with an automated voting system of student's president.

1.4 Feasibility Analysis

Feasibility study is a test of system according to its workability, impact of the organization, ability to meet needs and effective use of the resources. The objective is to determine whether the system is feasible or not through the following feasibility study mechanisms.

1.4.1. Technical Feasibility

The system is technical feasible it is evident that the necessary hardware and software are available for the development and implementation. It is possible to access one server by electronic devices if the user has access privilege. This project is practically applicable with in the current technology. So the system will technically feasible.

1.4.2. Operational Feasibility

Operational feasibility is a measure of how well a system solves the problems, and takes advantage of the opportunities identified during scope definitions. The WKU student union support this project .The system can provide accurate, active, secured service and decreases labor of workers.

1.4.3. Economic Feasibility

The existing system all the work are done manual so it is much costly and difficult to use, to operate and it is also time consuming. Therefore, this automated voting system is much feasible in costing time and effort too as compare with manual system.

1.5. Scope and Limitation of the project

1.5.1. Scope of the project

The system will be used for any Ethiopian university student union president voting system. But we will develop this system based on WKU student union voting process, so it will be use by others by customizing the system.

1.5.2. Limitation of the Project

➤ the system do not work on any device, which has no fingerprint recognition and does not use phone finger print scanner as finger print scanner.

1.6. Significance of the Project

The newly system will have many advantages in the following ways:

- Much easier to control security, and a much faster voting operation.
- To distinguish the candidate by their specific information
- Check to ensure that the voter who are registered are the only ones to vote
- Working load reduced for the election committee.
- Reduce the chance of error and elimination of Paper at a great cost savings.
- Voting services to the voters through fast, timely and convenient voting.
- A means to eliminate voting fraud and corruption
- It gives private online election process.
- It is possible to get instantaneous results and with high accuracy.

1.7. Beneficiary of the Project

There are so many beneficiaries from the system.

- The student of WKU: - students are beneficiary from the system because the system provides secure and reliable system and it provides equal opportunity for all students to follow the election process or activity.
- WKU student union: - the union can benefit from the system because it saves the required resources, labor forces, storage spaces for the data and it transforms the working environment from traditional to modernized ways.
- The WKU University and its community:- the university benefit from the system by means of burden sharing with automated system. It provides the convenient and peaceful learning and teaching environment.
- The system developers team: - system developers can benefited in terms of experience of development techniques, educational profile and for financial or income.

- Election commissions: - it can minimize their works or simplifies their tasks and it helps them to manage and provide transparent election system.
- The candidates can benefited from the system because the system provides reliable voting system.
- The country can benefited from the system. Since the country is on the way to democracy, the university has the responsibility to build a responsible generation in a democratic way. Practicing fair and free election, democratic and transparent election process is the prerequisites and ingredients for the national level election process.

1.8. Methodology of the Project

In order to accomplish this project on time and within the cost, follow different procedures which are described below

1.8.1. Data Collection Tools/Techniques

We used different methods to collect data. Among the methods, we use the following:

- **Document analysis:** To get more information about the project we used earlier documents that help us to develop the project. During the analysis of documents, we give a special consideration to those documents which can bring more features to the project.
- **Interviews:** To get the basic information and background information about the existing voting system, the team members interview the Student union and some students about the services, and the problems associated with that environment.
- **Observation:** Even though interview is very important to gather information, direct observation is simple and we physically observed information that cannot maintain from the interview or others.

1.8.2. System Analysis and Design

We use object oriented software engineering methodology (approaches) to develop our system. because it is a popular technical approach to analyzing, designing an application system, or business by applying the object-oriented paradigm and visual modeling throughout the development life cycles to foster better stakeholder communication and software product quality. Object Oriented Analysis is selected since it has so many advantages and which can make our system more effective.

1.8.3. System Development Model

We are going to use iterative software development model with the following core advantages.

- It makes versioning easier by ensuring every new iteration is an improved version of its previous iteration. Furthermore, if a new iteration fails, a previous iteration can be implemented or “rolled back” with minimal losses.
- Although it seems like there are a lot of stages to be followed through and repeated with the iterative model, it actually offers a rapid turnaround. Each stage is effectively slimmed down into smaller time frames over time, enabling the life cycle of each iteration to be significantly shorter.
- Another benefit of the iterative model is that it is easily adaptable. With frequent and constant iterations flowing out on a regular basis, rapid adaptability is another benefit, enabling companies to adapt to the needs of the project or client rapidly[4].

1.8.4. System Testing Methodology

1.8.4.1. Unit Testing

We use unit testing at the source code level for language-specific programming errors such as bad syntax, logic errors, or to test particular functions or code modules. The unit test cases shall be designed to test the validity of the program’s correctness. In this level of testing process we will test as[5].

- Check whether the return type of functions is correct.
- Check how the sub procedures or functions are called correctly.
- Check if the correct output is produced for different inputs.
- Check the efficiency of the code with respect to the memory and CPU time.

1.8.4.2. Integration Testing

The type of integration testing that we have followed is bottom up. So, we integrate each component from single functionality (individual interface) to the main function incrementally.

- Check the interaction between individual functionality which performs the specific tasks.
- Evaluate the functionality of the subsystem after combination all individual functionality.
- Identify the Independence of each subsystem with other subsystems

1.8.4.3. System Testing

In this level of testing process we will examine how nicely the subsystems of the whole voting system work together to achieve the desired goal.

1.8.5. Development Tools and Technologies

1.8.5.1 Frontend Technologies

We can use the following tools to develop front end part of this system:-

- JavaScript which is used to code client-side code.
- Bootstrap and CSS for styling the user interface.
- Django framework.
- Java for android development.
- Python

1.8.5.2. Backend Technologies

We can use the following tools to develop back end part of this system:-

- Django framework.
- Java for android development.
- HTML
- PostgreSQL database for web database.

1.8.5.3. Documentation and Modeling Tools

- Microsoft Word 2016 and Power point
- Adobe Photoshop
- Visio

1.8.5.4. Deployment Environment

We will deploy the system on university's main server and any authorized user can access the system by using their own android phone and web browser.

1.9 Document organization

The document organization of our project is well organized and documented. The project documentation has five chapters. Chapters' organization is based on the WKU CCI industrial project guidelines.

Chapter one contains the introduction part of the project:- It describes the statements of the problems, objectives, significances, beneficiaries, methodologies and approaches that we use are described well as necessarily.

Chapter two contains the description of the existing system: - It describes activities and major functions, users of the system and the business rules or the work flow as well as the drawbacks of the existing system.

Chapter three contains the proposed system: - in this chapter the functional and non-functional requirements of the system are described well. All the security and performance related issues and hardware and software requirements, the error handling mechanisms, and quality related concepts are also discussed in this chapter.

Chapter four contains System Analysis: - in the system analysis section all the system model (use-case model and diagrams, use-case descriptions and scenarios), object model (class diagram and data dictionary) and the dynamic model (sequence, activity and state chart diagrams) of the system are described clearly and precisely.

Chapter five contains system design: - the system design section discussed about the design goal, system architecture, system decompositions, software and hardware mapping and packages, detailed class and

consistent data management also described in this section. The abbreviated words used in the document are presented with their description in a table form for clear understanding.

CHAPTER TWO

2. DESCRIPTION OF THE EXISTING SYSTEM

2.1 INTRODUCTION TO THE EXISTING SYSTEM

All higher education have the right to form their own student unions in accordance with laws and regulation[1]. In accordance with this directive, Welkite University has established its own student union. Welkite University Student Union is playing a multi-faced role on the campus to accelerate teaching and learning process efficiently and peacefully. The union has its own general assembly (parliament) and has administrative structures called chief executive, speaker, and audit and oversight. The election process convene by the General Assembly under the coordination of the president of the union and seven-member of election committee will be elected. The Nominating committee then announces and post announcements of the registration of candidates who wish to run for the post of Executive Director of the Union and meet the requirement of the General Assembly on notice boards. Students who wants to run for presidential campaign first their cumulative GPA must be 2.75 and above and then the election committee will take 40% from certification, written exam, interviews and strategic plan and operation plan presentation, and then they must take written entrance exam and the top 8 students selected based on their exam score[1].

The criteria to run for presidential campaign are:-

- ❖ From certification 5 %
- ❖ From written exam 10%
- ❖ Oral interview 10%
- ❖ From strategic planning and operational planning 15%

The election committee presents the candidates with their 40% scores for the general assembly before the official voting day. And then the students vote will contains 60%. Students give their votes for the future leaders by going to the election auditorium. The candidates will introduce themselves, their campaigning logo and their plans to the students in the auditorium[1]. All the election processes are performed using manual/paper based system. The candidates' election

symbols and names of candidates are distributed to the voter by using paper, counting of votes is performed with manually so that this manual system has so many disadvantages.

2.2 Users of the existing system

The users of the existing system are listed below

- ❖ **The WKU Student Union:** - organizing, following up and administering the voting process is its responsibility. So that to control the overall process of election, WKU Student Union performs manually.
- ❖ **The election committee:** - the election committee is the coordinators of the whole voting campaigning process. It has seven members and they are the members of the General assembly. It has the following responsibilities :
 - ✓ It represents the head of the committee with agreements.
 - ✓ It submits the criteria of the election process to the General Assembly before the Election Day.
 - ✓ Announces the overall election schedules and register candidates.
 - ✓ Recruit neutral persons to follow the fairness of the voting process and presents it to the General Assembly.
 - ✓ It prepares recruitment rubrics like written exam, interviews, certification crosschecking and announces results to the General assembly.
 - ✓ Counts votes and announces the results and winners of the campaign.
 - ✓ Control candidates from transferring inappropriate information and using unauthorized voting symbols.
- ❖ **The voters:** - vote which is collected from the students vote has the value out of 60%. It is the important parts of the existing systems voting system process. So voters use the system for the following purposes
 - ✓ To register as a voter.
 - ✓ To follow the campaign and decide whom to vote.

- ✓ To give their votes for the future president.
- ✓ Even to check results of the winner of the campaign.
- ❖ **The candidates:-** the candidates are using the existing system for the following purposes
 - ✓ To register as a candidate
 - ✓ To run their presidential campaign
 - ✓ To check voting results.
 - ✓ To present their strategic and operational plans.

2.3 Major function of the existing system

The major function of the existing system are:

The existing system performs its day-to-day activities using a manual system. The major activities performed in the existing system are

- ❖ **Election committee formation:** - election committee which has seven members is formed before the candidate's registration and campaigning. The committee is formed from the member of the union. Then the committee posts announcements for candidate registration[1].
- ❖ **Candidate registration:** - candidates are register based on the requirements by the election committee[1].
- ❖ **Voters' registration:** - voters must be members of the parliament and they must give their vote. Authorized voters are the class representatives and the members of the parliament[1].
- ❖ **Campaigning:** - candidates' will be campaigning votes for me. This will be the only day the candidates and the voters are meeting and introduced each other[1].
- ❖ **Voting:** - the authorized voters will be presented at the voting place on the voting date to give their vote for their future president. And to attend the candidates' strategic and operational plans presentation. On that, the candidates present their special administrative plans they are going to follow if they are elected as president. This is the crucial moment for the candidates to show their leadership potential plan; and for the voters, it is the time they decide whom to vote[1].

- ❖ **Result announcement:** - the election committee will announce the vote result. The one who gets the highest overall scores will be the president of the union, the second winner will be the vice president, and the third winner will be the secretary[1].

2.4 Forms and other documents of the existing system

The WKU Student Union (STU) uses different forms for the voting process. Some of these forms are listed below:

- ❖ **Announcement form:** - the election committee uses a form to announce candidates' registration, voters' registration and voting day schedule by posting on notice boards.

5^ኛ ዙር የተማሪዎች ህብረት ምርጫ !

ለሁለት የሰራ ዓመታት የተማሪዎች ህብረት ዋና ሰራ አስፈጻሚ ምርጫ መወዳደር የምትፈለጉና ከዚህ በታች የተቀመጠውን መስፈርት ማሟላት የምትችሉ ተማሪዎች ከቀን 19-05-2013 እስከ ቀን 26-05-2013 ዓ/ም ድረስ በአይሲቲ ህፃን ሁለተኛ(2^ኛ) ፎቅ በሚገኘው ጊዜያዊ የምርጫ አስመራጭ ኮሚቴ ፅ/ቤት ቢሮ በአካል በመገኘት መመዝገብ የምትችሉ ሲሆን ስትራቴጂክ እቅድ(የሰራ ንድፈ ሀሳብ) ገቢ የማድረጊያ ጊዜ እስከ አለተ እሮብ ማለትም እስከ ቀን 26-05-2013 መሆኑን እንገልጻለን።

የመወዳደሪያ መስፈርቶች፡-

- ✓ የ2014 ዓ/ም እና ከዛ በላይ ተመራጭ ተማሪ የሆነ/ች(ቢያንስ 2 ዓመት የግቢ ቆይታ ያለው/ላት)።
- ✓ የክፍል ተወካይ ለመሆኑ/ኗ ከትምህርት ክፍል ሀላፊ ማሰረጃ ማቅረብ የሚችል/ምትችል ።
- ✓ ውጤት CGPA 2.75 እና ከዛ በላይ የለው/ላት።
- ✓ በጊቢ ቆይታው/ዋ በዲሲፒሊን ያልተቀጣ/ች ለዚህም ከተማሪዎች ዲን ማሰረጃ ማቅረብ የሚችል/የምትችል።

ከላይ የተዘረዘሩትን መስፈሪቶች ማሟላት የምትችሉ አመለካቾች በተባሉት ቀናት በአካል በመገኘት ማመልከት የምትችሉ መሆኑን እንገልጻለን።

ማሳሰቢያ፡- የ1^ኛ ዓመት ተማሪ እና ተመራጭ ተማሪ መምረጥ እንጂ መመረጥ አይችልም ።

አስመራጭ ኮሚቴው!!!

Figure 2. 1 Announcement from

- **Voting form:** - voting forms will delivered to voters to give their voice for the one whom they believed to be their future president on the voting day. This form used as a voting card for the voters to give their votes.

ተ.ቁ /R.N	ሙሉ ስም /full name	ፕሮቶኮል (5%) Protocol (5%)	የአቀራረብና ገለጻ ብቃት (15%) Presentation skill (15%)	በራስ መተማመን (5%)/ CONFIDEN CE (5%)	የንድፈ ሃሳብ ይዘት (20%) Strategic plan contain (20%)	ጥያቄ የመመለስ አቅም (10%) Capability of answering (10%)	የጊዜ አጠቃቀም (5%) Time management (5%)	አጠቃላይ ድምር (60%) /total (60%)
1.	ከንፈሚካኤል ዱላ / Kinfemichael Dula							
2.	ሚካኤል ያቦነሽ / Michael Yaboneshe							
3.	አሸናፊ መታፈርያ /Ashenafi Metaferia							
4.	ምትኩ ገብሬ /Metiku Gebera							
5.	አብይ ኩምሳ /Abiy kumesa							
6.	አመቱራህማን ባህረዲን / Ameturaheman bahredine							

Figure 2. 2 evaluation form

- **Laws and Regulation issued by the MSHE:** - the Ministry of Science and Higher education has formulates laws and regulation how the universities form their student union. All the universities have to follow this regulation and form their student union based on it. The law and regulation specifies that the establishment of the Student Union should make sure the participation of female students and it restricted the domination of one ethnic group in the

union. So that the establishment of the union must consider all the restrictions imposed by the MSHE.



የሳይንስና ከፍተኛ ትምህርት ሚኒስቴር
Ministry of Science and Higher Education - Ethiopia



ቀን/Date: ሐረ 30 2012
 ቁጥር/Ref: 0210/15.5/3536/12

ለአዲስአበባ የኒዘርሲቲ ለአዲስአበባ/ቲክ/ የኒዘርሲቲ ለአዲስአበባ/ቲክ/ የኒዘርሲቲ ለሐረርግያ የኒዘርሲቲ ለጎንደር የኒዘርሲቲ ለባህር ዳር የኒዘርሲቲ ለአርባ ምንጭ የኒዘርሲቲ ለባህር የኒዘርሲቲ ለዲሳ የኒዘርሲቲ ለጅማ የኒዘርሲቲ ለመቸለ የኒዘርሲቲ ለአክሱም የኒዘርሲቲ ለደብረብርሃን የኒዘርሲቲ ለደብረ ማርቀሰ የኒዘርሲቲ ለብረ ታቦር የኒዘርሲቲ	ለድራጃዎ የኒዘርሲቲ ለጅግጅጋ የኒዘርሲቲ ለመደመሳሰብ የኒዘርሲቲ ለሚዛን ቲፒ የኒዘርሲቲ ለሀመራ የኒዘርሲቲ ለወሎ የኒዘርሲቲ ለወላይታ ሶዶ የኒዘርሲቲ ለወላጋ የኒዘርሲቲ ለአዎቦ የኒዘርሲቲ ለቡሊሆራ የኒዘርሲቲ ለአሰሳ የኒዘርሲቲ ለወልዲያ የኒዘርሲቲ ለአዲግራት የኒዘርሲቲ ለወልቂሳ የኒዘርሲቲ ለዋቸም የኒዘርሲቲ	ለመቱ የኒዘርሲቲ ለጋምቤላ የኒዘርሲቲ ለአርሲ የኒዘርሲቲ ለሰላሌ የኒዘርሲቲ ለአባባልተም የኒዘርሲቲ ለራያ የኒዘርሲቲ ለአገደባራ የኒዘርሲቲ ጸባርት የኒዘርሲቲ ለመቅደላ አምባ የኒዘርሲቲ ለጦጋ የኒዘርሲቲ ለወራቢ የኒዘርሲቲ ለጂንባ የኒዘርሲቲ ለደምቢያሎ የኒዘርሲቲ ለተባራደሃር የኒዘርሲቲ ለተባራ ማትሮፖሊታን የኒዘርሲቲ
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ጉዳዩ፡- የተማሪዎች ሀብረት አደረጃጀትን ይመለከታል፤

በየኒዘርሲቲዎችን የሚገኙ ተማሪዎች ለዘላቂ ጥቅማቸው መብታቸውን ለማስከበር በሀገር በተፈቀደው መሠረት ተደራጅተው ይንቀሳቀሳሉ። የሚፈቀደውም የተማሪዎች ሀብረት አደረጃጀት ከፍተኛ ትምህርት ተቋማትን ለላማዊና በተለያዩባቸው ስኬታማ እንዲሆኑ ጉልህ ሚና ሊጫወት ይችላል። ስለሆነም ሀብረቱ የተማሪዎችንና የሀገራችንን ብዝሃነት ማዕከል አድርጎ እንዲሁም የሴቶችን ተሳትፎ በሚያረጋግጥ መልኩ ተደራጅቶ እንዲቀሳቀስ መደገፍ ያስልጋል። ስለሆነም ይህ የመንግስት ከፍተኛ ትምህርት ተቋማት ተማሪዎች ሀብረት የአደረጃጀትና የምርጫ አፈጻጸም መመሪያ 003/2012 ተዘጋጅቷል።

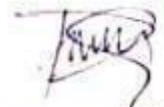
ስለዚህ ከታህሳስ 01/2012 ዓ.ም ጀምሮ በየኒዘርሲቲዎች ያለን የተማሪዎች ሀብረት አደረጃጀት ከዚህ መሻኛ ደብዳቤ ጋር በተያያዘው 13 ገጽ የተማሪዎች ሀብረት አደረጃጀትና ምርጫ መመሪያ ቁጥር 003/2012 መሠረት እንዲሆን ተገቢው ሁሉ እንዲፈጸም እያሳወኩ ተግባራዊነቱ በመደበኛ ሪፖርት እንዲካተት አሳስባለሁ።

ገልባጭ፡-

- ለሚኒስትር ጽ/ቤት
- ለሚኒስትር ደ.ኢ.ታዎች ጽ/ቤት (3)

ሳይንስና ከፍተኛ ትምህርት ሚኒስቴር

ከሰላምታ ጋር



ፋት ወ/ሮ/የተም ተከፋ (ፕረደሰር)
 ሚኒስትር

Figure 2. 3 guideline form

2.5 Draw backs of the existing system

The existing voting system has so many drawbacks. It follows manual/ paper based voting process. Since we are in the world of the technological era the traditional approach of voting system is not supported to accelerate and deliver the desired services to the customers. The dynamicity of the current working environment and service delivery, the manual system will have no significance contribution to transform the voting system to modernized system. Due to the following drawbacks the existing system is not efficient system.

- **Resource consumption problem:** - the manual system consume too much resources to provide the required services to the customers. The existing voting system needs too much manpower, time and materials such as paper and money. To organize the campaign it takes too much time but for voters it has limited time to process the options provided by the candidates.
- **Security issue:** - WKU Student Union (STU) voting system is not secure voting system. It is vulnerable to biased, hijacking of vote and the privacy of voters is not secured.
- **Double voting problem:** - one voter may vote more than one time or may give many votes for different candidates. This kind of problem leads to the voters to distrust the union working principles. Voting should be one vote for one candidate from a single voter.
- **Authorization problem:** - in Student Union voting system the voters are the students who are the member of the parliament. But unauthorized person may vote because in the existing system there is a weak mechanism to authorize voters.
- **Accessibility problem:** - the existing voting system is inaccessible. Voters cannot use the system to give their vote and follow the vote for me campaign from anywhere. They should be present physically in the voting arena on the voting day. Even it do not give enough time to analyze what the candidates provide for the voters. So being appear on the voting area on voting day will consume voters' time.
- **Data recording problem:** - manual data recording has so many disadvantages such as losing of necessary information, document destruction and information retrieving difficulty.

- **Efficiency problem:** - the existing system is not efficient as expected to be. Being inefficient is the big issue in the current voting system.

2.6 Business rules of the existing system

The existing system has its own working procedural principles. It follows parliamentary system. The work flow is based on these operating principles. The business rule of WKU Student Union (STU) helps the union to perform in accordance to the working principles to achieve the desired goal. Such business rules are

First rule: - The parliament recruits and establish election committee. This election committee has only one term of election. The recruitments of election committee members are three from the previous administrators of the student union, one from student union female's affairs and three from parliament members.

Second rule: - the election committee posts an announcements on notice boards to register candidates. Candidates who wants to register as candidates they must fulfill the requirements and prepare schedules for the election process. The requirements are

- They must be member of the parliament.
- They must have two or more years remain in the campus.
- Their cumulative grade (CGPA) must be 2.75 and above.
- They must not be first year students.
- They must be well behaved and disciplined.

Third rule:-candidate registration after evaluating the above criteria carefully the election committee select candidates and prepares written exam, oral interview, certification and strategic and operational plan presentation from 40%.

Fourth rule: - voters are registered to vote. To register as a voter they must satisfy the following requirements.

- They have to be members of the parliament.
- They must be class representatives.

Fifth rule: - the election committee will nominates election observers based on candidates suggestions or if they do no suggests it has full right to select neutral observers.

Sixth rule: - on the voting day candidates presents their strategic and operational plan for the voters so that voters can give their vote for whom convinced them.

Seventh rule: - voters give their vote after they watched candidates' presentation.

Eighth rule: - after collecting vote results the election committee will announces the winner of the campaign. Top as scorer as a president of the union, second scorer as vice president and the third scorer as secretary of the union.

Ninth rule: - the winners will give their promised words for the voters to serve the community in accordance to the rules and regulation with full commitment and dedication.

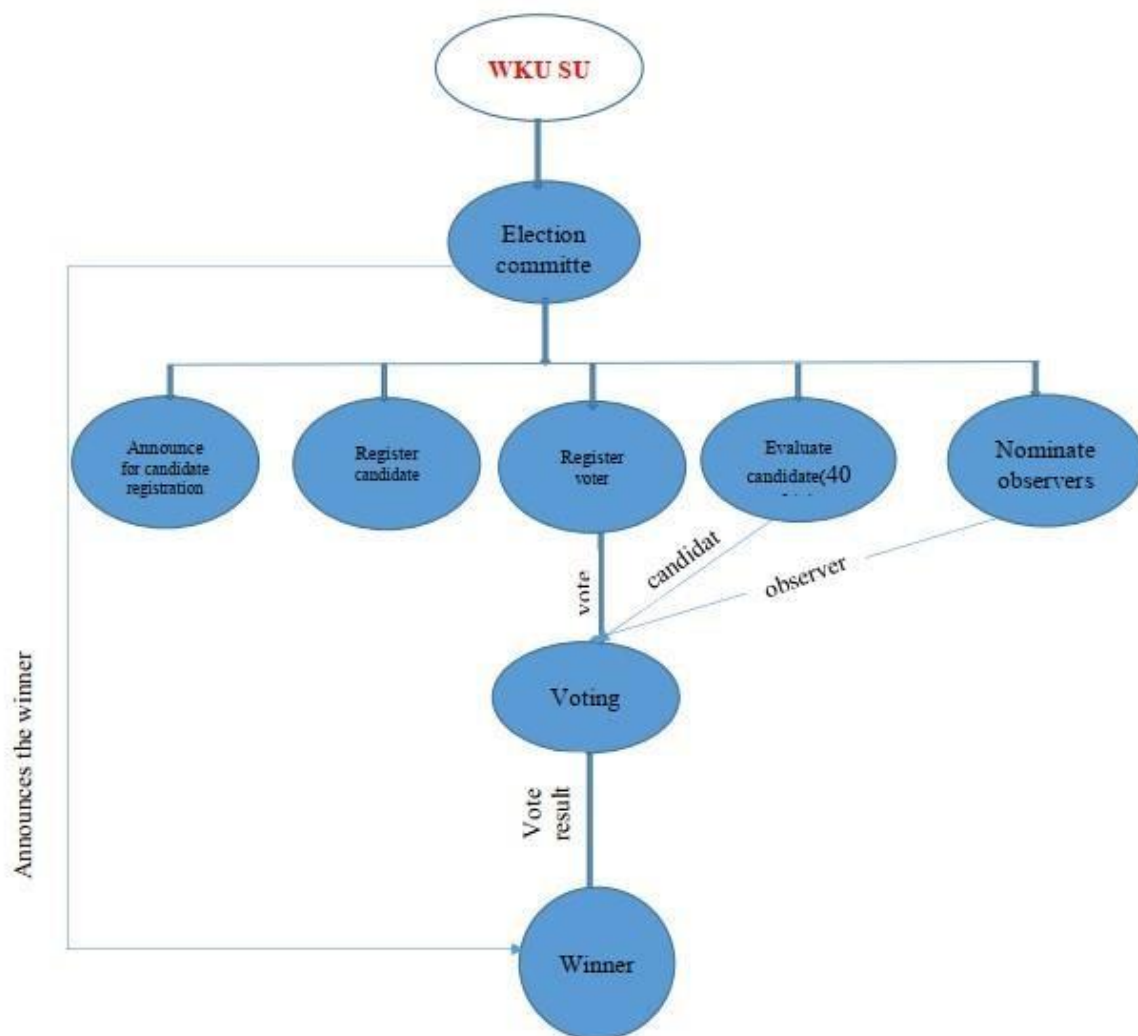


Figure 2. 4 existing system work flow

CHAPTER THREE

3 PROPOSED SYSTEM

The existing WKU student union president voting system is manual. In this manually process, several uncontrolled voting system problem should be taken into account. So, this project came up with solution that reduces problems of the current system and also additional functionality for the user. This chapter will fully describe all the functional and nonfunctional requirements, and other factors necessary to provide a complete description of the requirements in voting system for WKU.

3.1. Functional Requirements

The functional requirements are features that the system to satisfy the users need, the system designed according the roles of the users. Therefore, here we listed the functional requirement of the system based on the privileges.

The system have the following functionality

- Allows user to login into the system using their user name and password for first level verification and check fingerprint authentication for second level verifications based on users need what they want to do.
- Then the system redirects user to appropriate page based on user's privilege.
- Register with fingerprint: The system shall allow register candidates, election committee and voter with their finger print.
- Post announcement: - The system shall provide proper features like candidate information, election date, registration date, end date, election result and comments or questions for all visitors by election committee or administrator.
- Manage user: - the system shall allow administrator and election committee to create, delete and update the account to user based on their privilege.
- The system will allows to voter to give value out of 60% for each candidate based on their work.

- Then the system compute each candidate's value that come from voter (60%) and election committee (40%).
- The system will announce the winner based on computed value.
- The system allows user to register, update and view detail of him/her self
- Show result: The system shall allow visitors to view posted information after election is completed.
- Feedback: The system allows give feedbacks to union committee in different aspects.
- Generates Report: The system allows generate Reports of the election based on the candidate and voter by administrator.
- Logout: The system shall allow administrator, election committee and voters can logout from the system

The user and their role in the system is listed below.

Admin:-

The system will allows the admin to perform the following tasks.

- Register election committee formed from the member of the union based on requirement.
- Give privilege to election committee in the system.
- Shall able to updates, delete the election committee information from database
- Shall able to delete account of voter and candidate from database after election.
- The system allows Admin to register, update and view detail of him/her self
- The system allows Admin to approve election committee registration
- View announcement

Election committee: -

The system will allows the Election committee to perform the following tasks.

- Announce to candidates registration, voters registration and voting day schedule by posting through the system.
- Select students that have experience and best performance form registered one and announce for university society (student).

- Announce time that vote held for university society by post on website and selected candidate for Administrator and student.
- Shall able to updates, delete the voter and candidate information from database.
- Then the election committee will take 40% from certification 5%, written exam 10%, interviews 10% and strategic plan and operation plan presentation 15%.
- If anyone has complained, request and comment on election accept and give solution for it.
- Put election date and time taken for election in the system.
- Announce for university society winner student union for next two years.
- After voting finish, the system displays result for the user.
- The system allows user to register, update and view detail of him/her self
- The system allows election committee to approve registration of candidate and Voter
- Take any complain that come from candidate and vote
- Give appropriate answer for any complain that come from candidate or voter.
- The system allows election committee to vote as a voter
- View announcement

Candidate: -

The system will allows the candidate to perform the following tasks.

- Run their presidential campaign through the system.
- View and check the voting result
- Report any complain to election committee if exist
- Register as a candidate.
- Put his/her advertise information (getting promise) for election in the system.
- View announcement

Voters/students:

The system will allows the voters to perform the following tasks.

- They are register by fulfilling the needed criteria.
- The voters can login into the System based on system verification.
- Give value out of 60% for each candidate based on their work.
- Write comment to election committee or candidate if exist.
- Can view his/her personal details and other announcement.
- The system allows voter to register, update and view personal detail of his/her self
- The system shall allow voters to view candidate's information, election results, and cast vote (choose the candidate he want).

3.2. Non-functional Requirements

Non-functional requirements describe aspects of the system that are not directly related to the functional behavior of the system, only related to how the system will do the functional requirement. Nonfunctional requirements include a broad variety of requirements that apply to many different aspects of the system, from usability to performance.

3.2.1. User Interface and Human Factors

As the system is developed that follow good user interface guide line and it provides the user interface that is easy and simple to use and attractive and interactive for the user of this system. And user of this system that means voter, candidate, and election committees should only to have android phone or computer to browser to connect the internet. Only the admin should be skillful and professional but candidates and voters should not be professionals they are required just to know basic computer functions. So, there is no need of computer professions only the person who know basic computer and how to browse the internet can use this system.

3.2.2. Hardware Consideration

Our proposed system will be developed by considering the hardware requirements. The system will support smartphones and computers to provide the desired service. No need for extra hardware required. Any devices that can support fingerprint will be supported by the proposed system. A Fingerprint detection device is available in the CCI College that means no need for additional fingerprint devices. Compatibility will not be a problem in the proposed system because

it will developed to run on any operating systems such as, Linux/Ubuntu, windows, androids and IOS.

For the deployment environment, our system will be deployed with the WKU deployment server.

Basic devices which are our proposed system required are:

- Cellphones which support finger-print
- finger-print recognizer devices
- computers
- deployment server/ environment

3.2.3. Security Issues

The system can allow only authorized user to entering based on unique voter id and Finger print verification and also able to encrypt user's password using MD5 encryption algorithm. In addition to this we will use session and cookie.

3.2.4. Performance Consideration

The voting system operates its function relatively with a short period of time. The election committee, the candidates and voters should have internet access and electronics devices which supports fingerprint. The system will not have any performance problem because it will be developed based on the requirements. As long as the necessary devices and network connection are available the system will be functional without any performance issue.

- It required considerable response time. It can provide the desired service within a short period of time.
- The resource consumption of the system is less.
- The system will support many users at a time as long as they use different devices.
- The system architecture will supports scalability and customization.
- Timely tuning of a problem will be possible for the system.

3.2.5. Error Handling and Validation

The systems can able handle exceptions that may happen while user uses the system. It handles exceptions of data duplication to save memory space error related to voting system such as one voter may vote more than one candidate

3.2.6. Quality Issues

Our system will reliable by handling exceptions when the user uses the system as mentioned before and by performing its function consistently. In the quality assessing the users will be involved by a feedback mechanism in which they can give comments on the system. The system will have no quality issues.

- The functions of the system are appropriate, implemented correctly, handle data securely, and follow laws and guidelines.
- The system will be reliable as long as the server of the WKU is not down the system will perform its full operation as it is expected to perform.
- The usability of the system will be clear and understandable by users and do not required much effort to understand the system functionalities because it will be user-friendly.
- Since the system development follows a good coding approach and efficient architectural design, therefore, our system will be efficient.
- As much as possible the system will be developed to be fault-free and fault tolerable. Failure and fault can be identified and will be fixed quickly. The sustainability of the system will be assured.
- The system will be developed to change adaptable and scalability and customization will be as simple as a piece of cake. So it makes the system portable.

3.2.7. Backup and Recovery

The system will use two databases for backup and recovery purposes. One database can be used only for storage of information to prevent data losses due to failure and the other one is will used for the overall activities of the system.

3.2.8. Physical Environment

The system is deployed on university's main server and any authorized user can access the system by using their own android phone and web browser

3.2.9. Resource Issues

To use and access the system the users of the system are required to have necessary devices which supports fingerprint. The resource consumption of the is considerably too low. It will save time; the required manpower will be considerably minimized; and the required electronics device are already available.

- Cellphone
- Computers
- Deployment environment
- Fingerprint detector device
- Internet access

Therefore the system's resource issue will not be a challenge for the implementation or functions of the system.

3.2.10. Documentation

For a system user level document is provided that the user can read the document to know how to use the system and what functionality should the system support to the user. And also, development process is provided that user can read to know about the process and what type of model developer uses to develop the syste

CHAPTER FOUR

4. SYSTEM ANALYSIS

System analysis is the process of collecting and interacting facts, identifying the problems and decomposition of a system into its components[6]. The analysis model contains the functional model, object model and the dynamic model. The functional model can be described by use case diagram. The object diagram can describe the object model and the dynamic model can be described in terms of sequence diagram, state chart diagram and activity diagram[7]. In our project we are using functional model to describe the analysis model of the system, and object model and dynamic models described by using use case, sequence diagram, activity diagram, state chart diagram, and class diagram.

4.3. System Model

System model is the process of developing abstract models of a system, with each model presenting a different view and perspective of the system. The system model will help the system analysts to understand the functionality of the system and it is also used to communicate with customers[8].

We use the following diagram to describe different model interactions:

- Activity diagram to show the data proceeding flow.
- Use case diagram to show the interactions between a system and its environment.
- Sequence diagram to show the interaction between actors and the system and between the system components.
- Class diagram to show the object classes in the system and the association between classes.
- State chart diagram to show how the system reacts to internal and external events.

4.3.1. Use Case Model

A use case model is a model of how different types of users interact with the system to solve a problem. It describes the goals of the users, the interactions between the users and the system, and the required behavior of the system in the satisfying goals. A use case model consists of a number of model elements. These important model elements are use cases, Actors and the relationships between them[9].

4.3.1.1. Use Case Diagram

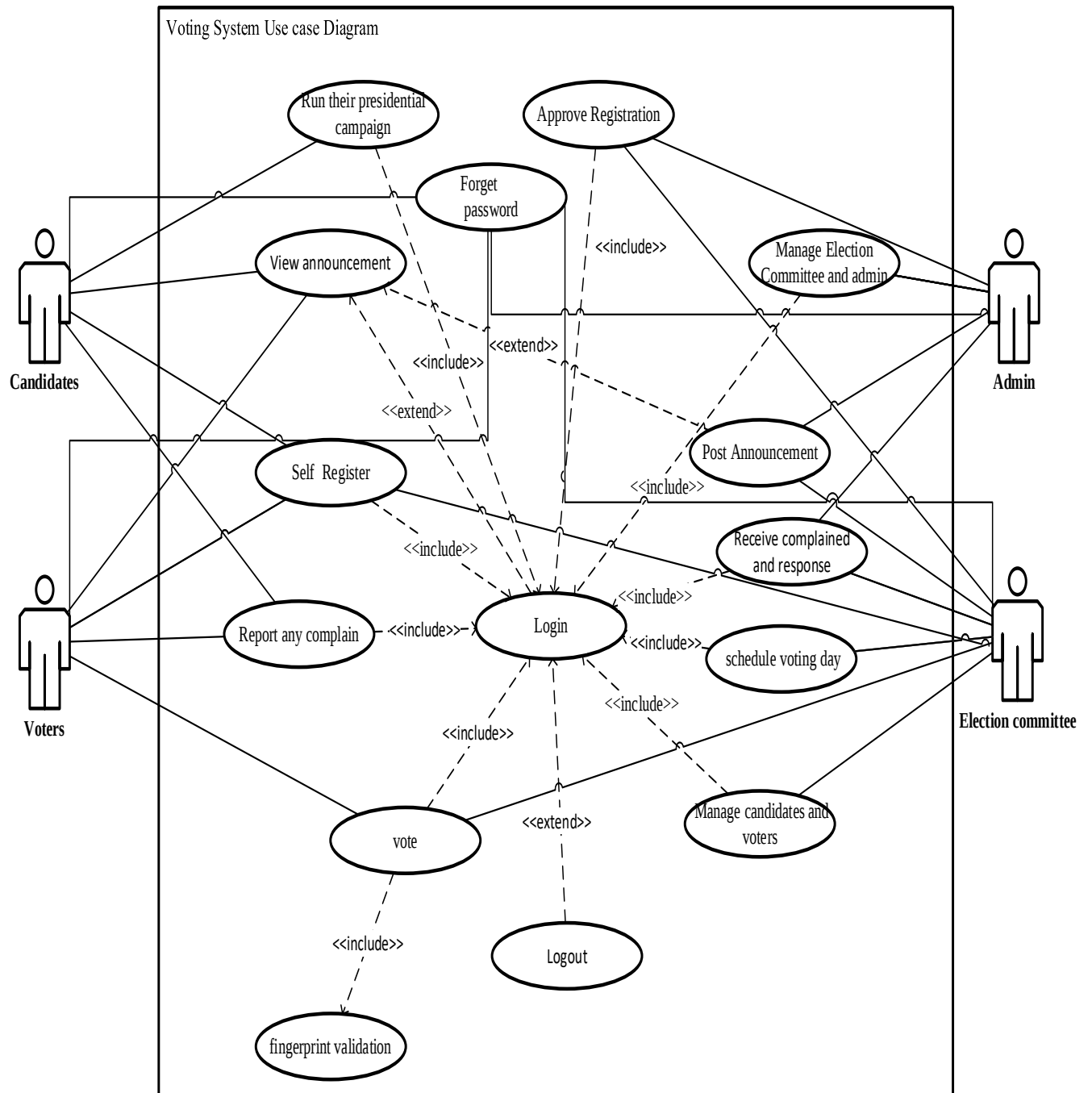


Figure 4. 1 voting system use case diagram

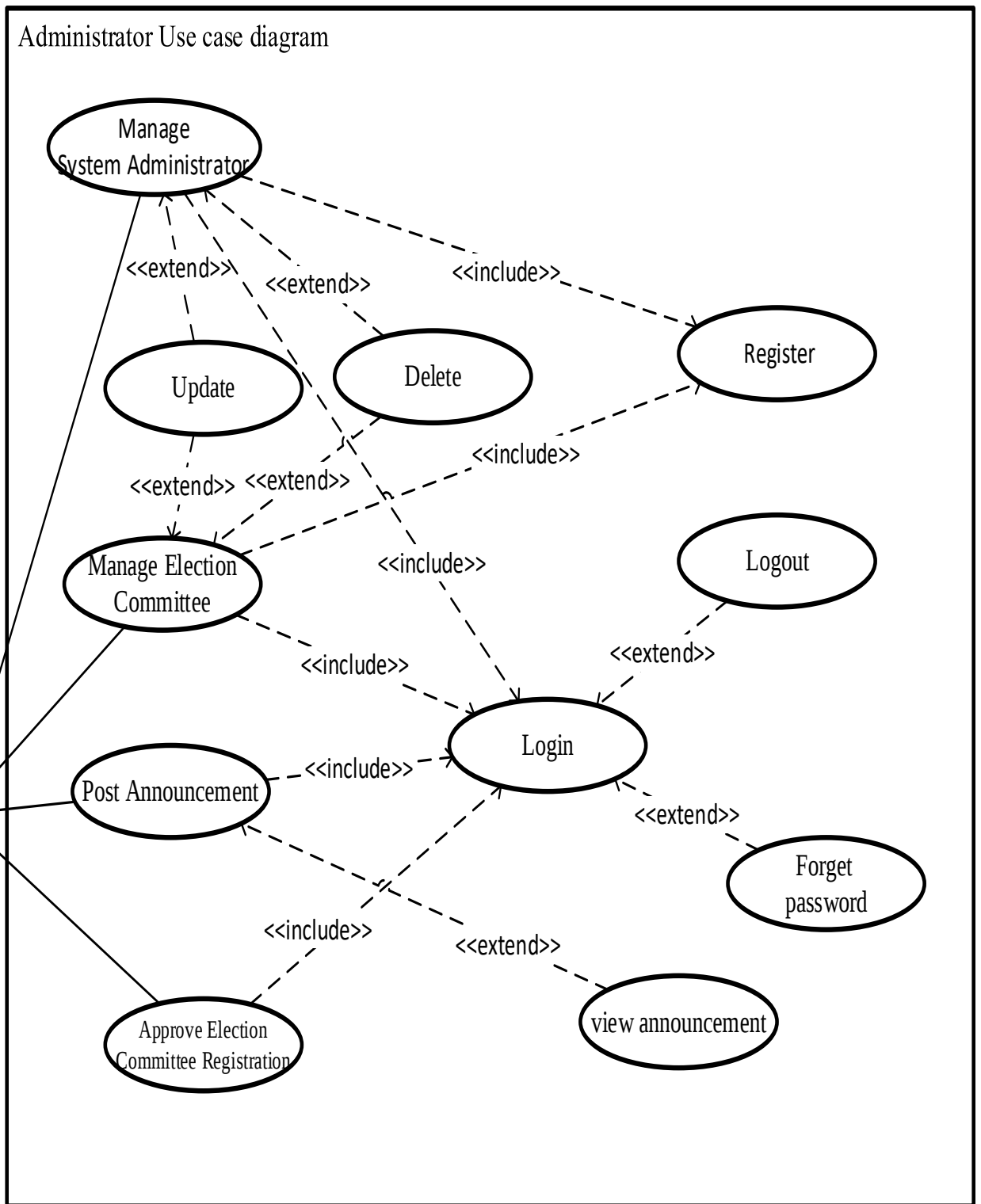


Figure 4. 2 Admin use case diagram

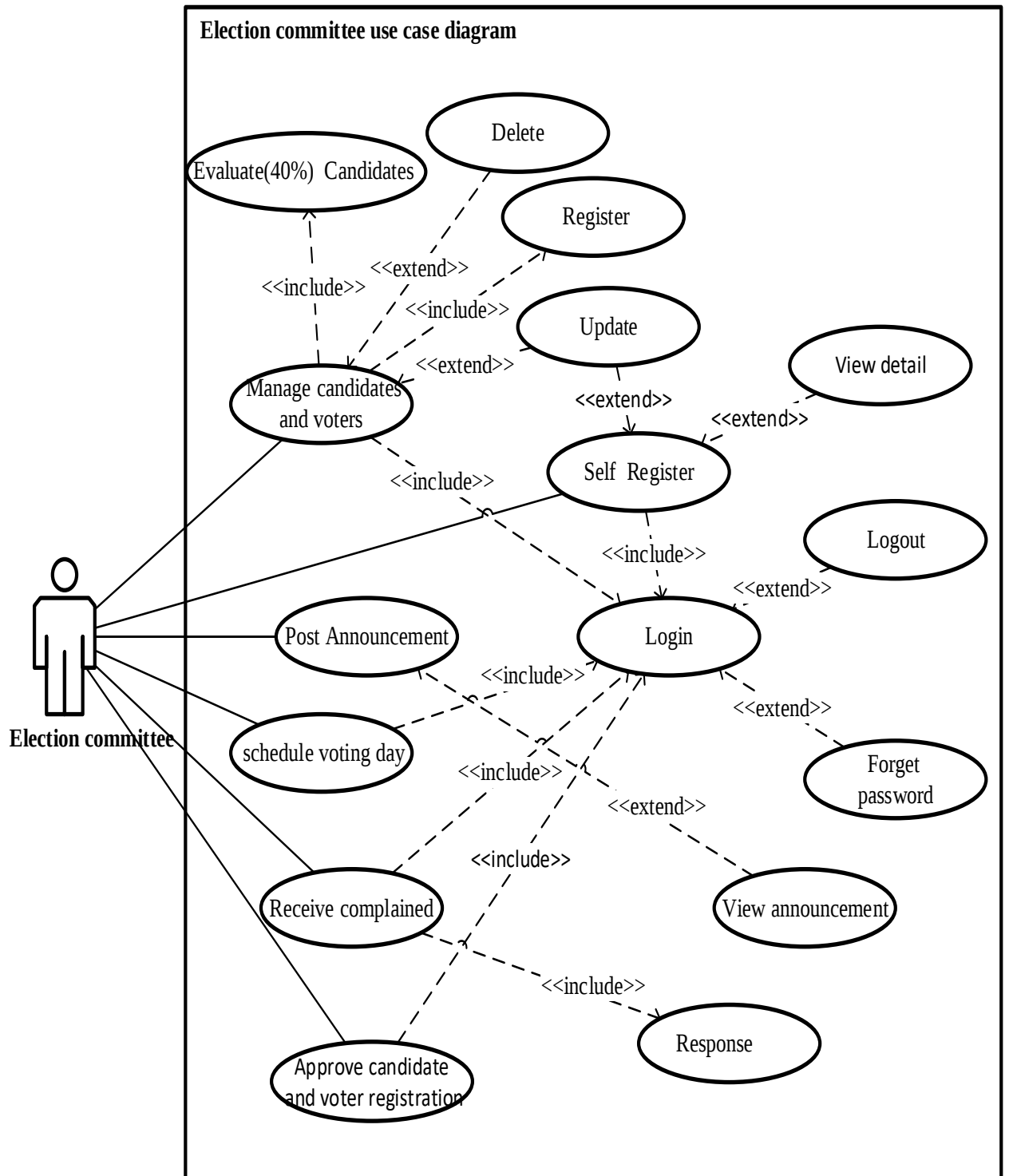


Figure 4. 3 Election committee use case diagram

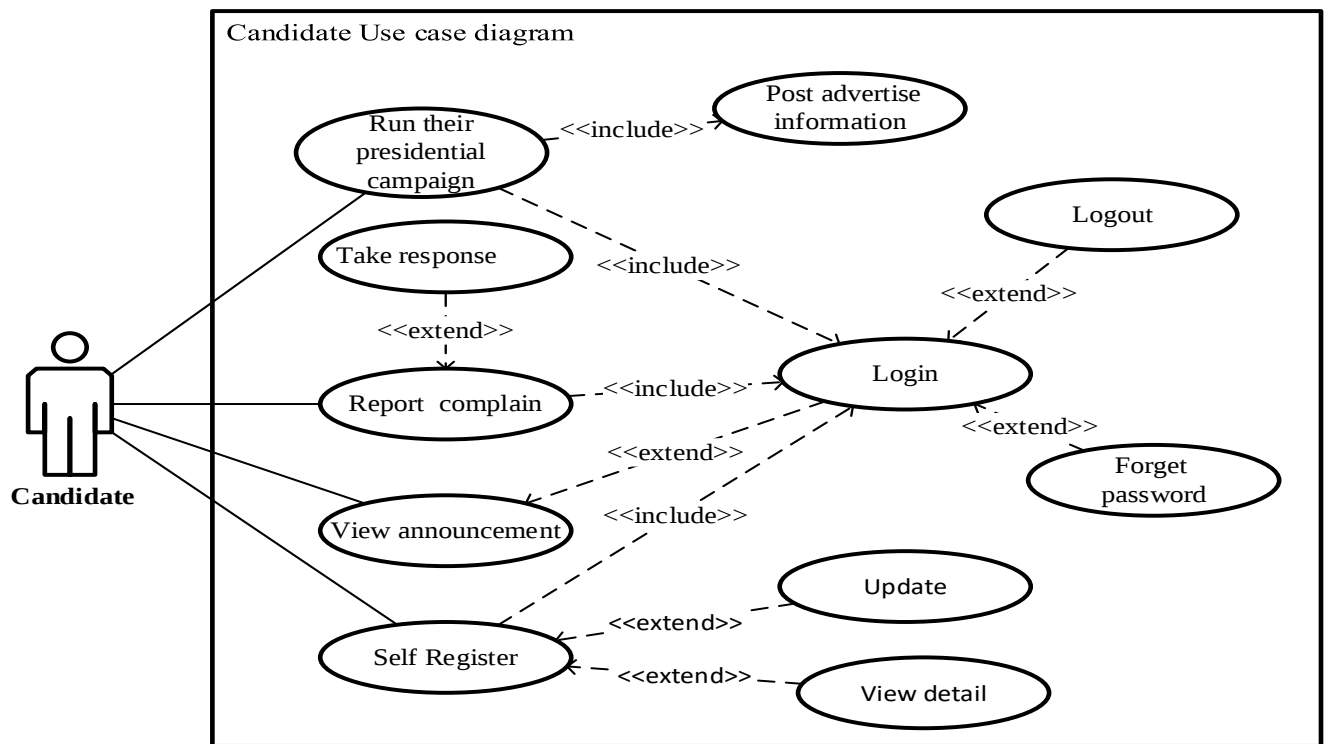


Figure 4. 4 candidate use case diagram

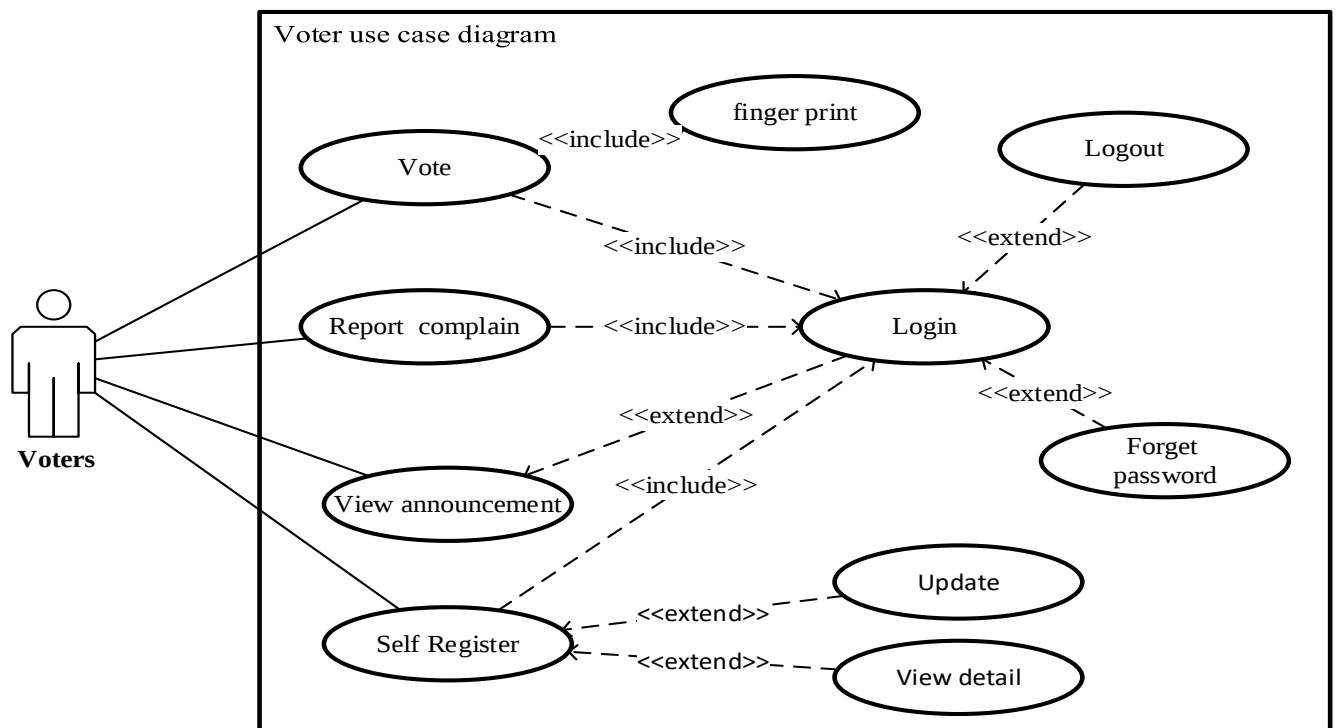


Figure 4. 5 voter use case diagram

4.3.1.2. Use Case Description

The use case descriptions used to describes what the use case system functionalities works. It also used to describe how the user perform or use the functionalities of the system in order to achieve the desired goals. Detailed use case descriptions are discussed below.

Use case description for Registration

Table 4. 1 registration use case description

Use case name	Registration
Use case Number	UCN-01
Description	Admin and Election Committee must be register first to access and use the system functionalities.
Actor	Admin and Election Committee.
Precondition:	1. Actors should have to be the member of the WKU STU. 2. The Actor should have to browse the WKU STU voting website or App to register.
Normal flow	1. The system will display the Home Page. 2. The Actor click the registration button on the Home Page. 3. The system displays the Registration form. 4. The Actor enters information and click on the register button. 5. The system checks information if it is valid or not valid.

	6. If the entered information is valid the system displays an assurance (Are you sure to submit?)Yes/No message. 7. The Actor click yes to register. 8. Then the system register the Actor and store his information on the database. 9. The system displays successfully registered message.
	10. If entered information is invalid the system displays error message. 11. End use case.
Alternative flow	4.1 If the Actor entered invalid data type on fields. i. The system displays data type mismatch on the field message. ii. The Actor repeats step 3 from the normal flow. 4.2 If the Actor leaves a field empty. i. The system will display this field should not be empty message. ii. The Actor repeats step 3 from the normal flow.
Post condition	The system displays successfully registered message.

Use case description for login

Table 4. 2 login use case description

Use case Name	Login
Use case Number	UCN-02
Description	It describes how the actors log into the system in order to use the system functionality.
Actor	Admin, Election committee, Candidates, Voters.
Precondition:	Actors must register first to access the system.
Normal flow	1. Actor click the login button on the Home Page. 2. The system displays the Login Page. 3. Actor enters username and password then click login button. 4. The system checks validation of username and password. 5. If the Actor has an account the system will displays the account page (UI). 6. If the Actor has no account the system will not display the account page (UI).
	7. End use case.
Alternative flow	4.1 If the Actor enters invalid username or password. i. The system displays invalid username or password. Please enter valid username or password.

	ii. The Actor repeats step 3 from the normal flow. 4.2 If the Actor leaves the username or password fields empty. i. The system displays username or password field cannot be empty message. ii. The Actor repeats step 3 from the normal flow. 4.3 If the Actor forgot password. i. Then the Actor can reset his/ her password. ii. The system will display successfully reset password message.
Post condition	The Actor can have an access to his account.

Use case description for Managing

Table 4. 3 mangling use case description

Use case name	Managing Actors
Use case Number	UCN-03
Description	1. The Admin have full administrative rights and granting privilege to the Election committee. 2. The Election committee will have full administrative rights on candidates and voters.
Actor	Admin and Election committee.
Precondition:	The Actors should have administrative rights.

Normal flow	1. Admin Actor will registered as Admin. 2. Register Election committee. 3. The Admin will grant administrative privilege to Election committee. 4. Election committee will register Candidates and voters.
	5. Login username and password will provided to the Actors. 6. End use case.
Alternative flow	1. If Actors' information required update, i. Then Admin can update information. ii. The system displays information is successfully updated. 2. If the Election committee or its member removed from election committee or finished its tasks. i. Admin will delete the Election committee or its member from the system. ii. The system will display election committee or member is successfully deleted message. 1. If Candidates' and Voters' information required update. i. Then the Election committee can update their information. ii. The system will displays information is successfully updated message. 2. If removing Candidates or Voters is required.

	i. Election committee can delete Candidates or Voters. ii. The system will displays Actor is successfully deleted message.
Post condition	Successfully updated or deleted messages will displayed.

Use case description for Post Announcements

Table 4. 4 post announcement use case description

Use case name	Post Announcement
Use case Number	UCN-04
Actor	Admin and Election committee.
Description	1. The Admin will post announcements for Election committee to register.
	2. The Election committee will post announcements for Candidates and Voters to register, voting schedules and voting day.
Precondition:	Actor must login into the system.

Normal flow	1. Open the WKU STU Home Page. 2. Login to the system. 3. Click on post new announcements button. 4. Post form will displays. 5. The Actor will enter new posts on the form and click post button. 6. The system will check validation of the inputted values. 7. If input values are valid. 8. The system displays new announcement is successfully posted message. 9. End use case.
Alternative flow	5.1 If the input values are invalid. i. The system displays invalid input message. ii. The Actor repeats step 5 from the normal flow.
Post condition	The system will displays new announcements/ information is successfully posted message.

Use case description for Evaluation

Table 4. 5 evaluation use case description

Use case name	Evaluation
Use case Number	UCN-05

Actor	Election committee
Description	1. The Election committee will evaluates Candidates from 40% before voting day. 2. The evaluation is from candidates' certificates, entrances exam and oral interviews.
Precondition:	Candidates must register and take entrance exam.
Normal flow	1. The Election committee must login to the system. 2. The election committee select Evaluate Candidate button. 3. The system displays evaluation form. 4. Election committee selects candidate to evaluate. 5. The election committee enter data on the form. 6. Election committee click on OK button. 7. The system checks data validation. 8. If data is valid displays data successfully stored on the database message. 9. Steps from 4 up to 8 are repeated until all registered candidates are evaluated. 10. End use case.

Alternative flow	5.1 If the election committee entered invalid data. i. The system will displays input data is invalid. ii. The election committee repeats step 4 from the normal flow. 5.2 If the election committee leaves a field empty. i. The system will displays field cannot be empty. Please fill the field with correct data message. ii. The election committee repeats step 4 from the normal flow.
Post condition	The system displays candidate is successfully evaluated message.

Use case description for voting day scheduling

Table 4. 6 voting day scheduling use case description

Use case name	Voting day scheduling
Use case Number	UCN-06
Actor	Election committee
Description	The election committee will schedule the voting when and where to hold the voting process.
Precondition:	To announce the voting day and place the election committee must login to the system.

Normal flow	1. Election committee must access the WKU SU Home Page. 2. Election committee must login to the system. 3. Select voting scheduling link and click OK button. 4. The system displays scheduling form. 5. Enter voting day schedule. 6. Click submit button. 7. The system check date format and validation. 8. If the data is valid. 9. The system displays voting day is successfully scheduled and posted message. 10. End use case.
Alternative flow	5.1 If the entered date and year is already past. i. The system will display entered date and year is not valid date message. ii. Return to step 5 from normal flow. 5.2 If the entered date and year are not reachable. i. The system will displays unreachable date and year message. ii. Return to step 5 from normal flow. 5.3 If the range and format of days, months and year are out of limit.

	i. The system will displays day, month and year are out of limit message. ii. Return step 5 from normal flow.
Post condition	Displays Voting day is successfully schedule message.

Use case description for Running Campaign

Table 4. 7 running campaign use case description

Use case name	Running campaign
Use case Number	UCN-07
Actor	Candidate
Description	Candidates post their vote for me manifesto for voters in order to promote their strategical and operational plans.
Precondition:	Candidates must login into the system.
Normal flow	1. Access home page. 2. Candidates login into the system 3. Click running campaign link 4. Upload file page displayed 5. Candidates upload their manifesto. 6. Click submit button. 7. The system checks file format validation. 8. If file format is valid the system will displays manifesto uploaded successfully message.

	9. End use case.
Alternative flow	5.1 If the file format is invalid. i. The system will display invalid file format message. ii. Returns to step 10.
Post condition	The system will display vote for me manifesto is successfully uploaded message.

Use case description for View new posts

Table 4. 8 view post use case description

Use case name	View new posts
Use case Number	UCN-08
Actor	Admin, Election committee, candidates and Voters.
Description	Actors can view new posts related with announcements, candidates manifesto and voting day schedules.
Precondition:	1. Actors must login to view new posts. 2. Posts must be available.
Normal flow	1. Actors must browse WKU SU Home Page. 2. The system displays the login page. 3. Actors login into the system. 4. Actors click on new posts link. 5. The system displays new posts.

	6. End use case.
Alternative flow	Not available.
Post condition	Actors view new posts and returns to the home Page.

Use case description for view profile

Table 4. 9 view profile use case description

Use case name	View profile
Use case Number	UCN-09
Actors	Admin, Election committee, Candidates, Voters.

Description	Actors can view their personal information on the View profile link.
Precondition	1. Actors must login into the system to view their personal information. 2. Personal information must be available.
Normal flow	1. Actors must browse the WKU SU Home page. 2. The system displays login page. 3. Actors login into the system. 4. Actors click on view profile link. 5. Personal information displayed. 6. End use case.
Alternative flow	Not available.
Post condition	View personal information and returns to the Home Page.

Use case description for voting

Table 4. 10 voting use case description

Use case name	Voting
Use case Number	UCN-10

Actor	Voters
Description	Voters give their votes for the candidate they believing.

Precondition:	Voters must logged in to give their vote.
Normal flow	1. Voters access the home page. 2. The system displays the login page. 3. Voters login into the system. 4. Voters click on Give Vote link. 5. The system displays lists of Candidates. 6. Voters select candidates. 7. The system displays vote form. 8. The voter fill the form and click vote button. 9. The system asks the voter to give his/her fingerprint. 10. The system scans the voter fingerprint. 11. Voter click on submit vote button. 12. If fingerprint matches. a. The system will provide assurances (are you sure to give your vote?) Message. b. The voter click yes button. c. The system increments candidate's vote by +1. d. Then the system automatically changes the candidate's status. 13. The system displays vote is successfully counted message.

	14. End use case.
Alternative flow	7.1 If fingerprint mismatch. i. The system will display fingerprint mismatch message. ii. Repeats step 7 from normal flow. 7.2 If the voter already votes. i. The system will displays you cannot vote more than one message.
	ii. The system returns the voters to the Home Page.
Post condition	Display vote is successfully counted and returns to the Home Page.

Use case description for View Result

Table 4. 11 view result use case description

Use case name	View result
Use case Number	UCN-11

Actor	Admin, Candidates, Election committee and voters.
Description	Actors can view the winners of the campaign using the view result link.
Precondition	1. Actors must login into the system. 2. Voting campaign must end.
Normal flow	1. Actors must access the browser. 2. The system displays the login page. 3. Actors login into the system. 4. The system displays the UI. 5. Actors click on the view result link. 6. The system displays the result. 7. End use case.
Alternative flow	Not available.
Post condition	Results displayed and actor can returns to the home page.

Use case description for Reporting complain

Table 4. 12 report complain use case description

Use case name	Reporting complain
Use case Number	UCN-12
Actor	Candidates
Description	If the candidates have any complain about voting process and vote results, they can report to the election committee.

Precondition:	There must be complain.
Normal flow	1. Candidates must login into the system. 2. The system displays the UI Home Page. 3. The candidate clicks on the report complain link. 4. The system displays complain form. 5. Candidate enters any complain. 6. Candidate click submit complain button. 7. The system checks data validation. 8. If the inputted data are valid the system displays complain is successfully reported message. 9. End use case.
Alternative flow	5.1 if the invalid data are inputted i. The system displays invalid data type message. ii. Repeat step 5 from normal flow.
Post condition	Displays complain successfully reported and candidates can returns to Home Page.

Use case description for Response complain

Table 4. 13 response complain use case description

Use case name	Response complain
Use case Number	UCN-13
Actor	Election committee

Description	The Election committee will give responses for candidates complain about the result and vote process.
Precondition:	1. Complain must be available. 2. Election committee must receive complain from candidates.
Normal flow	1. Election committee must access the login page. 2. The system displays login page. 3. Election committee login to the system. 4. UI page is displayed. 5. Election committee click on Response complain link. 6. The system displays response form. 7. Election committee enter response. 8. Election committee click on respond button. 9. The system checks inputted data types. 10. If the data type valid the system displays complain is successfully responded message. 11. End use case.
Alternative flow	7.1 If invalid data type are inputted. i. The system displays invalid data type message. ii. Repeat step 7 from normal flow.
Post condition	Complain is successfully responded message is displayed.

4.3.1.3. Use case Scenario

Use case scenario describes the real world examples how the user of the system interact with the system. It describes the steps and action events takes place to interact with the system[7]. it can be very detailed and indicates exact work flow within the user interface as well it describes the high level business actions of the system.

Scenario name: User Login

Participating Actor: Mr. Yayal

Initial assumption: browser must open and connection must available.

Normal flow of events:

- Mr. Yayal click on the login link on the home Page.
- The system displays the login form.
- Mr. Yayal enters username and password and click login button.
- The system validates the data inputted by Mr. Yayal.
- Mr. Yayal successfully logged into his account.
- Use case end.

Alternative flow of events:

- If Mr. Yayal enters invalid username and password the system displays invalid username or password message.
- If Mr. Yayal leaves username or password field empty the system displays field cannot be empty message.

Scenario name: User registration

Participating Actor: Mr. Worku

Initial assumption: the Home Page must be displayed first.

Normal flow of events:

- Mr. Worku click on register link on the Home page.
- The system displays the registration form.
- Mr. Worku enter information on the registration form.

- Mr. Worku click register button to send/submit information.
- The system validates the information entered by Mr. Worku.

The system displays assurance Yes/No (are you sure you want to send information?) message.

- Mr. Worku click on yes to submit information.
- The system displays registration is successful message.
- The system returns Mr. Worku to the Home Page.
- Use case end.

Alternative flow of events:

- If Mr. Worku enters invalid data type the system displays invalid data type message.
- If Mr. Worku leaves a field empty the system displays a field cannot be empty message.

Scenario name: Announcement Post

Participating Actor: Ms. Kelem

Initial assumption: Ms. Kelem logged into the system must be Admin or Election Committee member.

Normal flow of events:

- Ms. Kelem logged into the system.
- Ms. Kelem click on Announcement Post link on the Admin or Election Committee Home Page.
- The system displays new Announcement Post form.
- Ms. Kelem enters and uploads new announcements
- Ms. Kelem click upload button to post new announcements.
- The system validates inputted data by Mrs. Kelem.
- The system displays (are you sure you want to post this?) Yes/No message.
- Ms. Kelem click yes button to post the new announcement.
- The system displays new announcement is successfully posted message.
- Use case end.

Alternative flow of events:

- If Ms. Kelem inputted invalid data the system displays invalid data message.

If Ms. Kelem inputted invalid file format then the system displays file format mismatch message.

- If Ms. Kelem do not enter or upload any new data the system displays you did not add any new data message.

Scenario name: Voting

Participating Actor: Mr. Amare

Initial assumption: Mr. Amare must register as a voter to give his vote.

Normal flow of events:

- Mr. Amare login to the system.
- Mr. Amare click on voting link on the Home Page.
- The system displays the voting form.
- Mr. Amare fills the form and click vote button.
- The system displays (are you sure?) Yes/No message.
- The system validates the data.
- Mr. Amare click yes to give his vote.
- The system requested Mr. Amare to give his fingerprint.
- The system scans Mr. Amare's fingerprint.
- The system displays vote is successfully counted message.
- The system returns Mr. Amare to the Home Page.
- Use case end.

Scenario name: Report Complain

Participating Actor: Mr. Yosef

Initial assumption: Mr. Yosef must be candidate and must have complain.

Normal flow of events:

- Mr. Yosef logged in to the system Home Page.
- The system displays the UI Home Page.
- Mr. Yosef click on Report Complain link on the Home Page.

The system displays the complaining form.

- Mr. Yosef fills his complain on the form and click Report complain button.
- The system displays validates and assurance (are you sure) Yes/No message.
- Mr. Yosef click yes button.
- The system displays complain reported successfully message.
- Use case end.

Alternative flow of events:

- If Mr. Yosef entered invalid data the system displays invalid data input message.
- Mr. Yosef return to the form enters valid data.

4.4. Object Model

4.4.1. Class Diagram

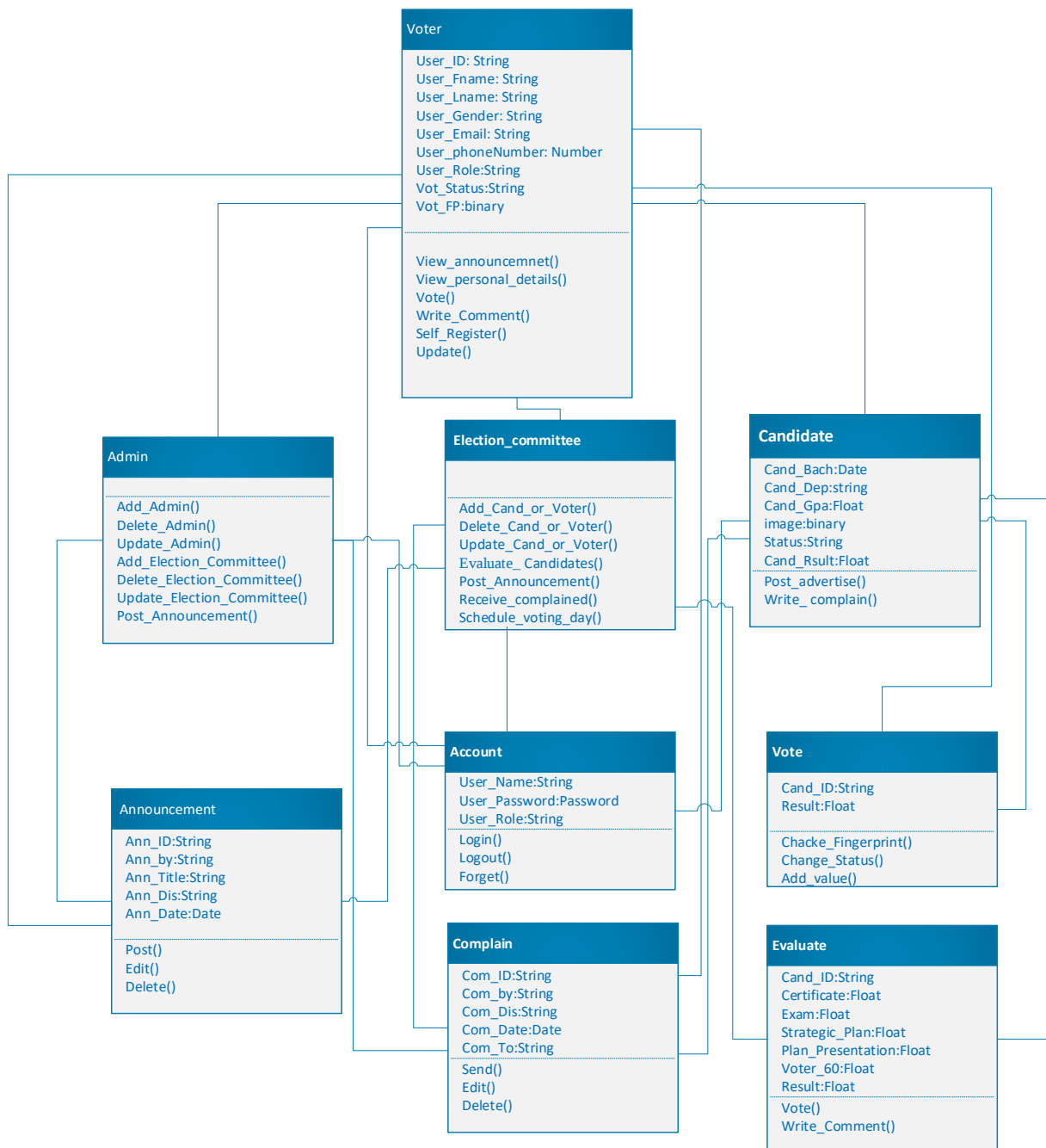


Figure 4. 6 class diagram

4.4.2. Data Dictionary

As the system able to save/store information about real world entity in to different data files we present data dictionary of the system that describe which data is stored in which data file. Data dictionary is description of database table of the system such as attribute, data types, data size, key constraints and constraint of identified entities. In our WKU student union voting system the following table describe data dictionary.

🚦 Table name: - **voter**

- Primary key: - **User_ID**
- Description:-used to store system user information

Table 4. 14 data dictionary of election committee

Attributes	Data type	Data size	Constraint	Description
User_ID	String	32	Primary key	Unique identification for election committee
User_Fname	String	32	Not null	Store name of election committee
User_Lname	String	32	Not null	Store last name of election committee
User_Gender	String	7	Not null	Store sex of election committee
User_Email	String	32	Not null	Store email address of election committee
User_Phone_number	String	15	Not null	Store phone number of election committee
User_Role	String	42	Not null	The role of election committee to store

🚦 Table name: - **Candidate**

- Primary key: - Cand_ID
- Description:-used to store candidate information

Table 4. 15 data dictionary of candidate

Attributes	Data type	Data size	Constraint	Description
Cand_Bach	Date		Not null	Store year(Bach) of candidate
Cand_Dep	String	32	Not null	Store department of candidate
Cand_Gpa	Float		Not null	Store grade of candidate
Image	Binary		Not null	Store image of candidate. The voter sees the candidate image and vote that he/she want
Status	String	50	Not null	Store the progress level of candidate
Cand_Rsult	Float		Not null	Store the voting result. The candidate to sees the voting result

🚦 Table name: - **voter**

- Primary key: - Vot_PID
- Description:-used to store voter information

Table 4. 16 data dictionary of vote

Attributes	Data type	Data size	Constraint	Description
Vot_VID	String	32	Unique	Unique identification of voter id

Vot_Status	String	42	Not null	Store the information about the voter vote the candidate or not
Vot_FP	Biomatrix		Not null	Store finger print recognition of voter

 Table name: - **Announcement**

- Primary key: - Ann_ID
- Description:-used to store related information with announcement

Table 4. 17 data dictionary of announcement

Attributes	Data type	Data size	Constraint	Description
Ann_ID	String	32	Primary key	Unique identification for announcement
Ann_by	String	32	Not null	The person that post announcement
Ann_Title	String	32	Not null	Title of announcement
Ann_Dis	String	32	Not null	Description of announcement
Ann_Date	Date		Not null	Date of announcement

 Table name: - **Complain**

- Primary key: - Com_ID
- Description:-used to store any complain related voting process

Table 4. 18 data dictionary of announcement

Attributes	Data type	Data size	Constraint	Description
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Com_ID	String	32	Primary key	Unique identification for complain
Com_Dis	String	150	Not null	Description of the complain(idea that the candidates and voters write to election committee)
Com_Date	Date		Not null	Store date of complain
Com_response	string	150	null	Store complain response
Com_To	String	32	Not null	Election committee receive complain that come from candidates and voters

 Table name: - **Account**

- Primary key: -
- Description:-the user of the system used to access the system by using user name and password

Table 4. 19 data dictionary of account

Attributes	Data type	Data size	Constraint	Description
User_Name	String	32	Not null	Name of user used to login in to account
User_Password	Password	30	Not null	Password of user
User_Role	String	32	Not null	Role of user

4.5. Dynamic Model

4.5.1. Sequence Diagram

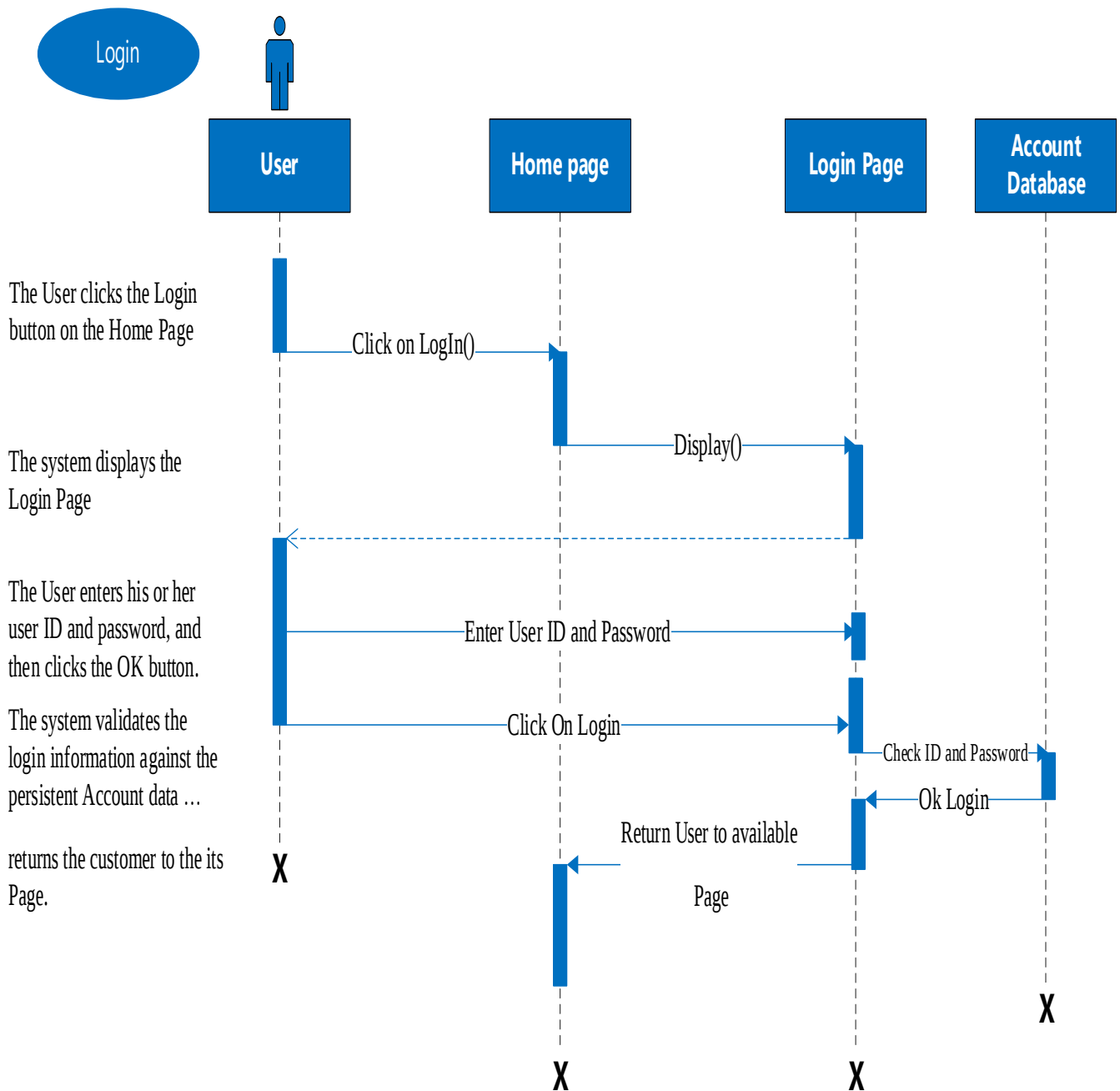


Figure 4. 7 login sequence diagram

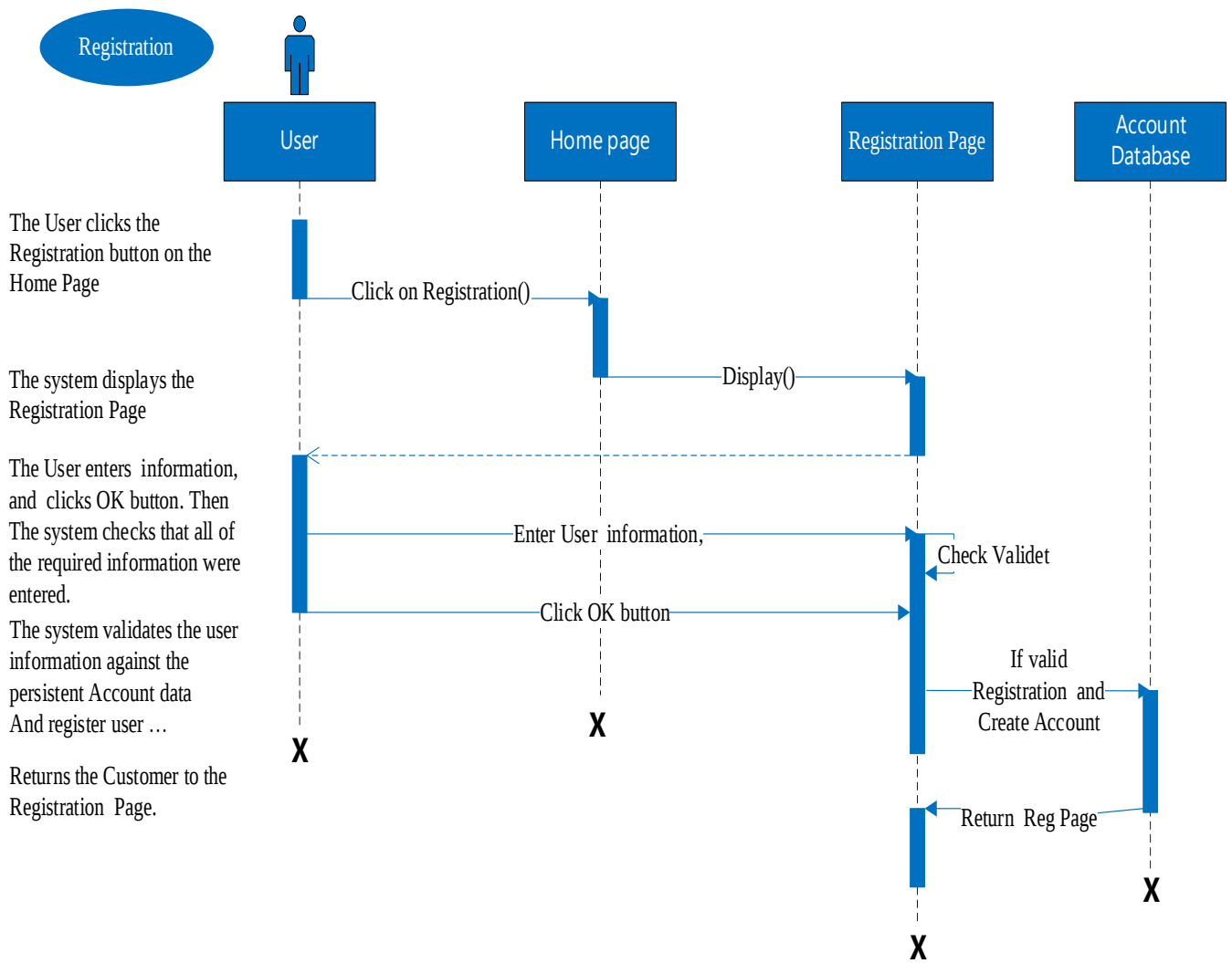


Figure 4. 8 registration sequence diagram

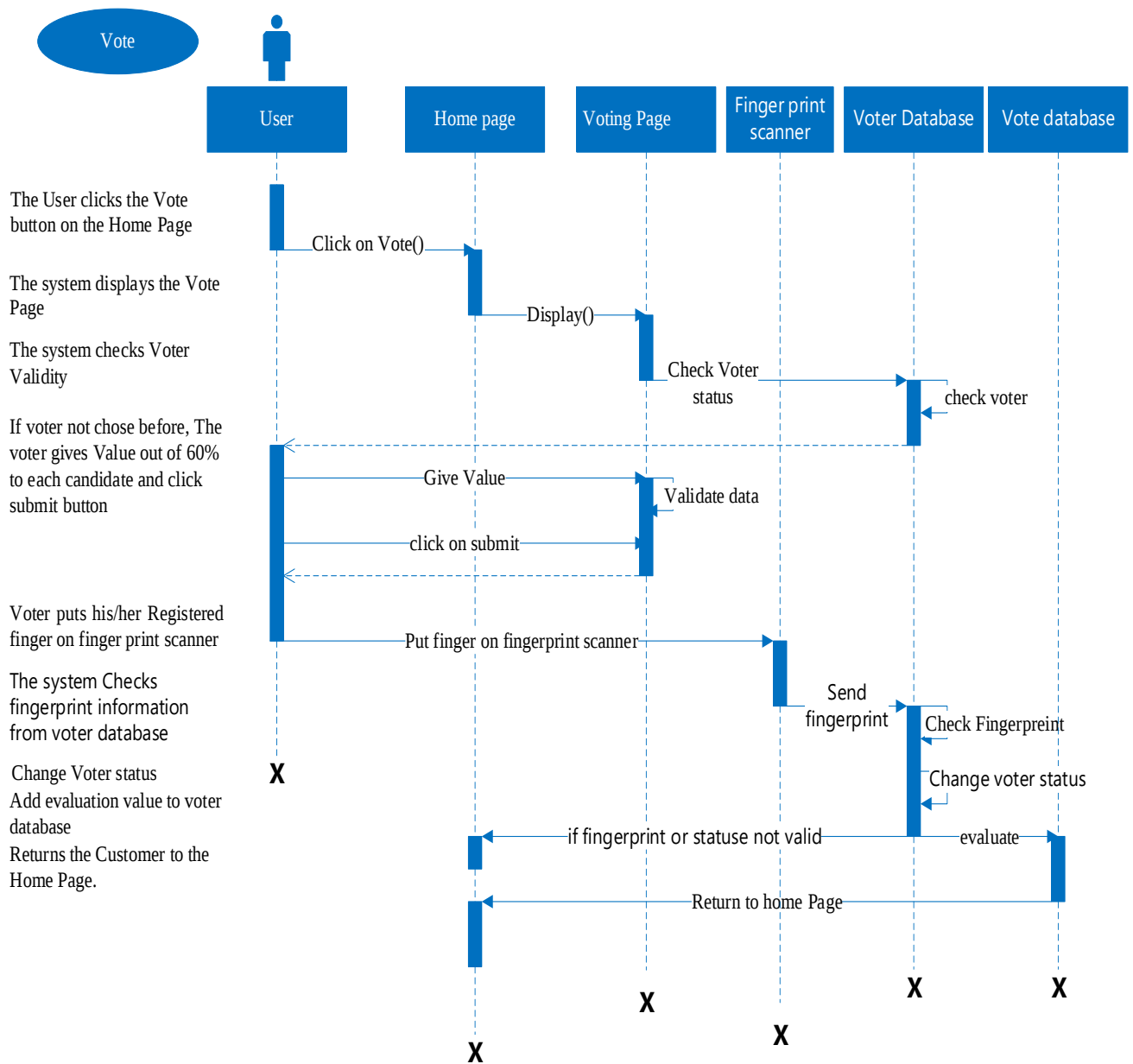


Figure 4. 9 voting sequence diagram

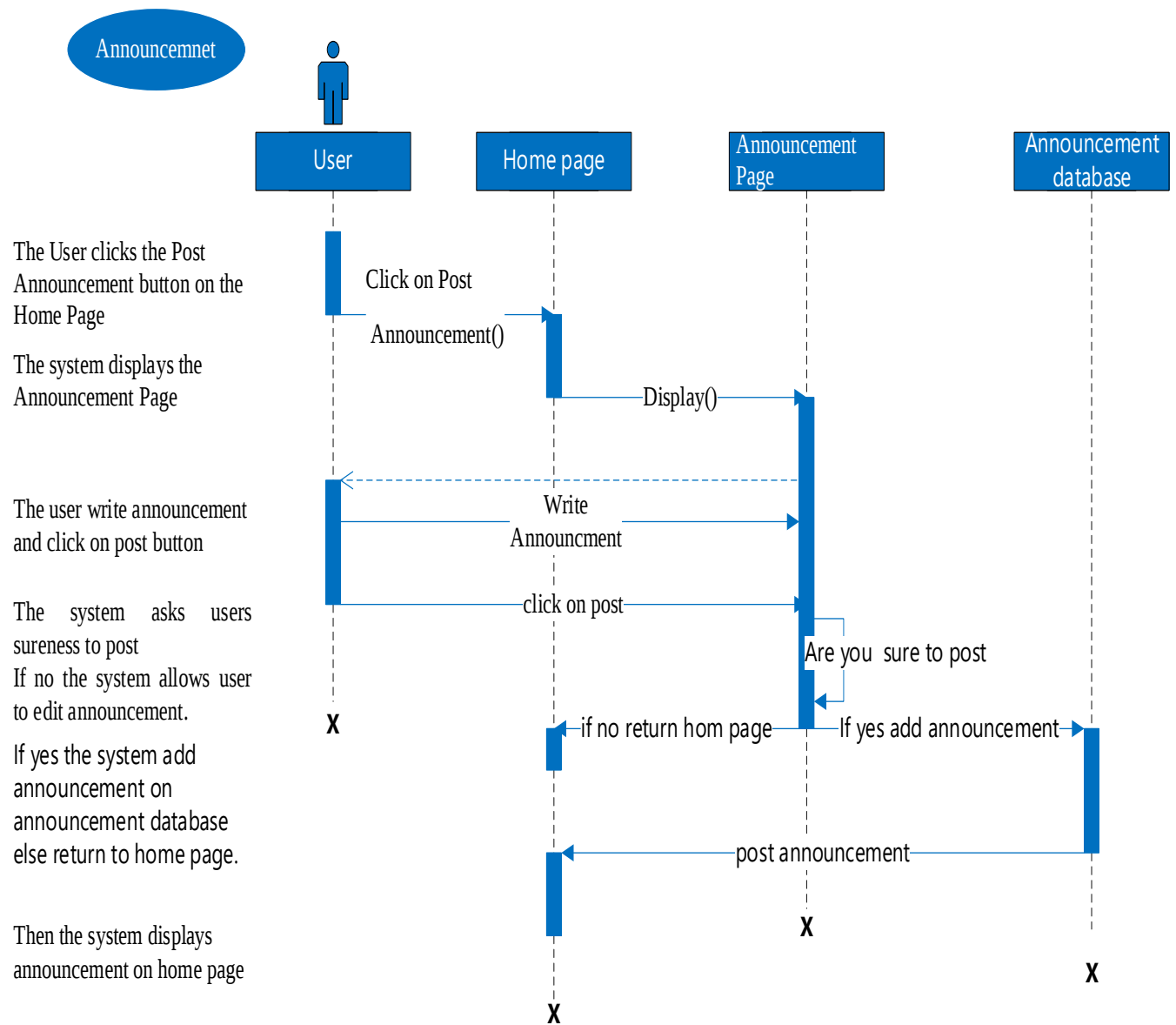


Figure 4. 10 announcement sequences diagram

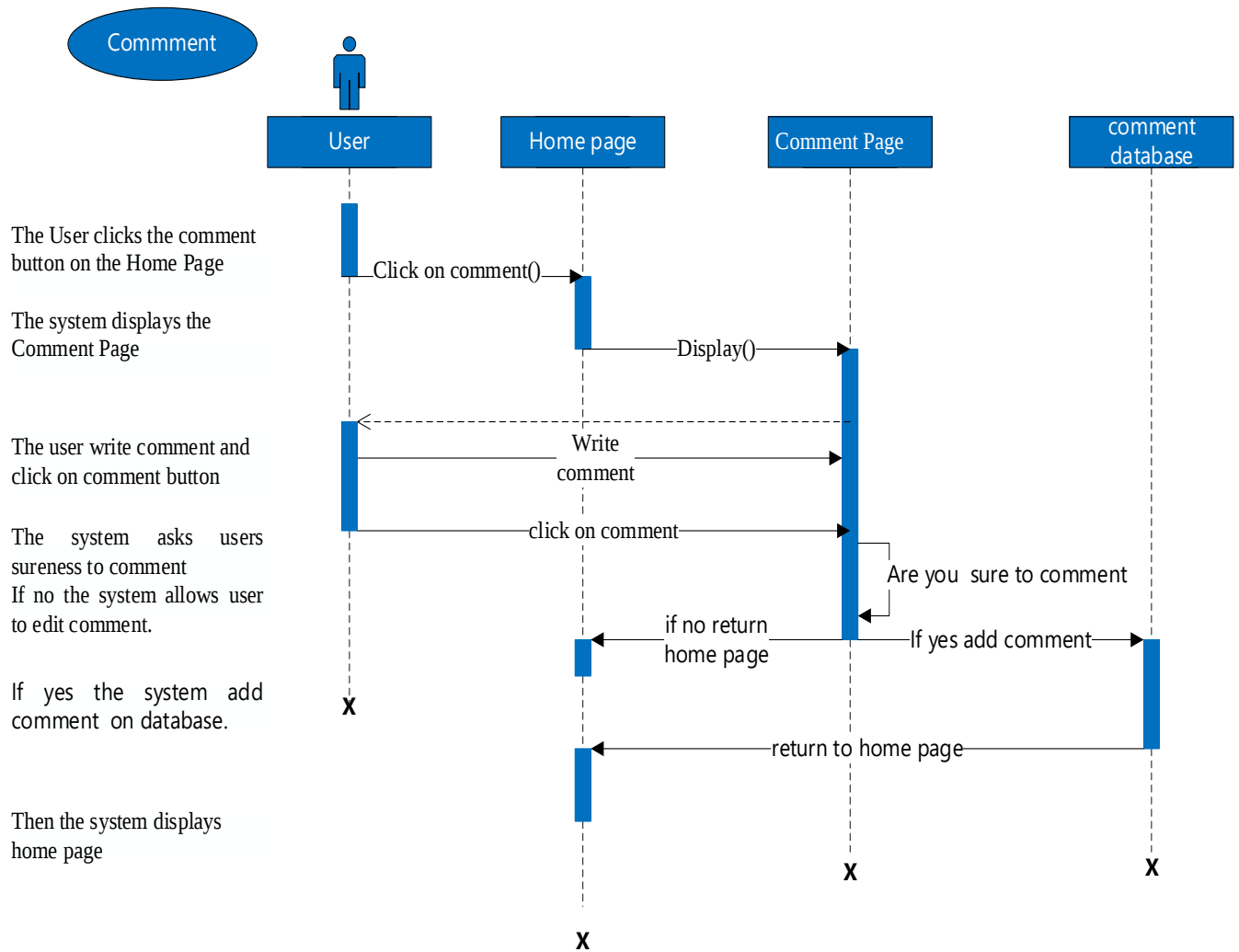


Figure 4. 11 Comment Sequences diagram

4.5.2. Activity Diagram

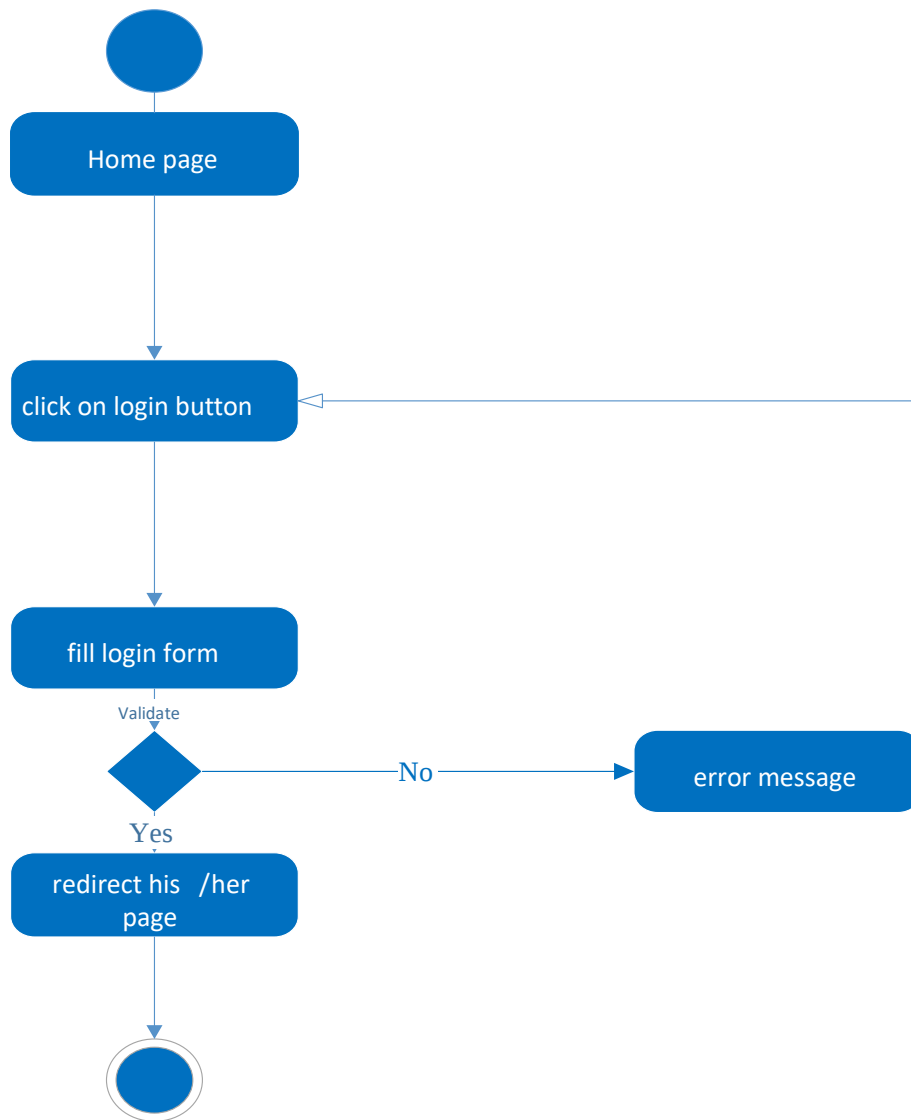


Figure 4. 12 login activity diagram

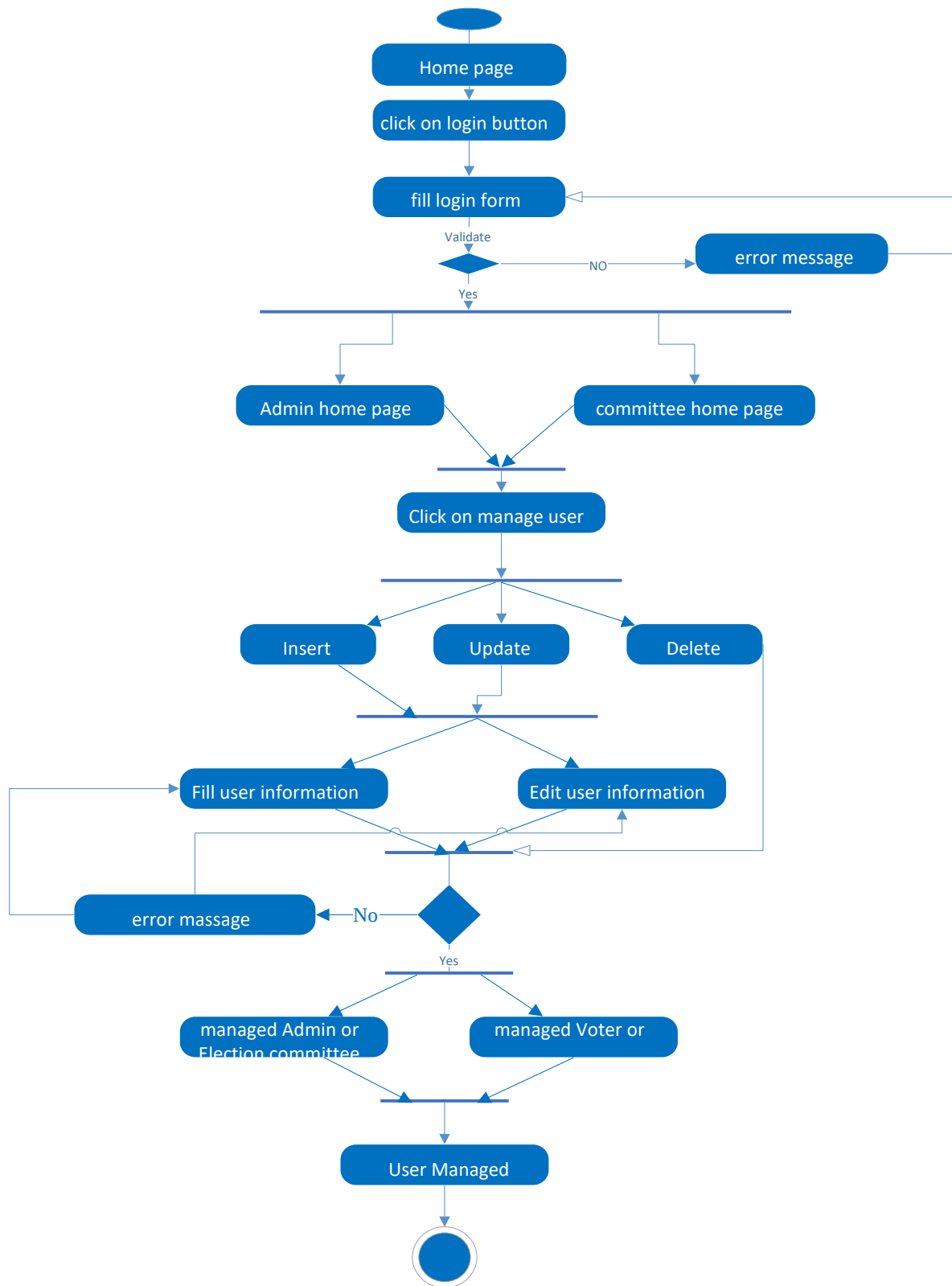


Figure 4. 13 mange user activity diagram

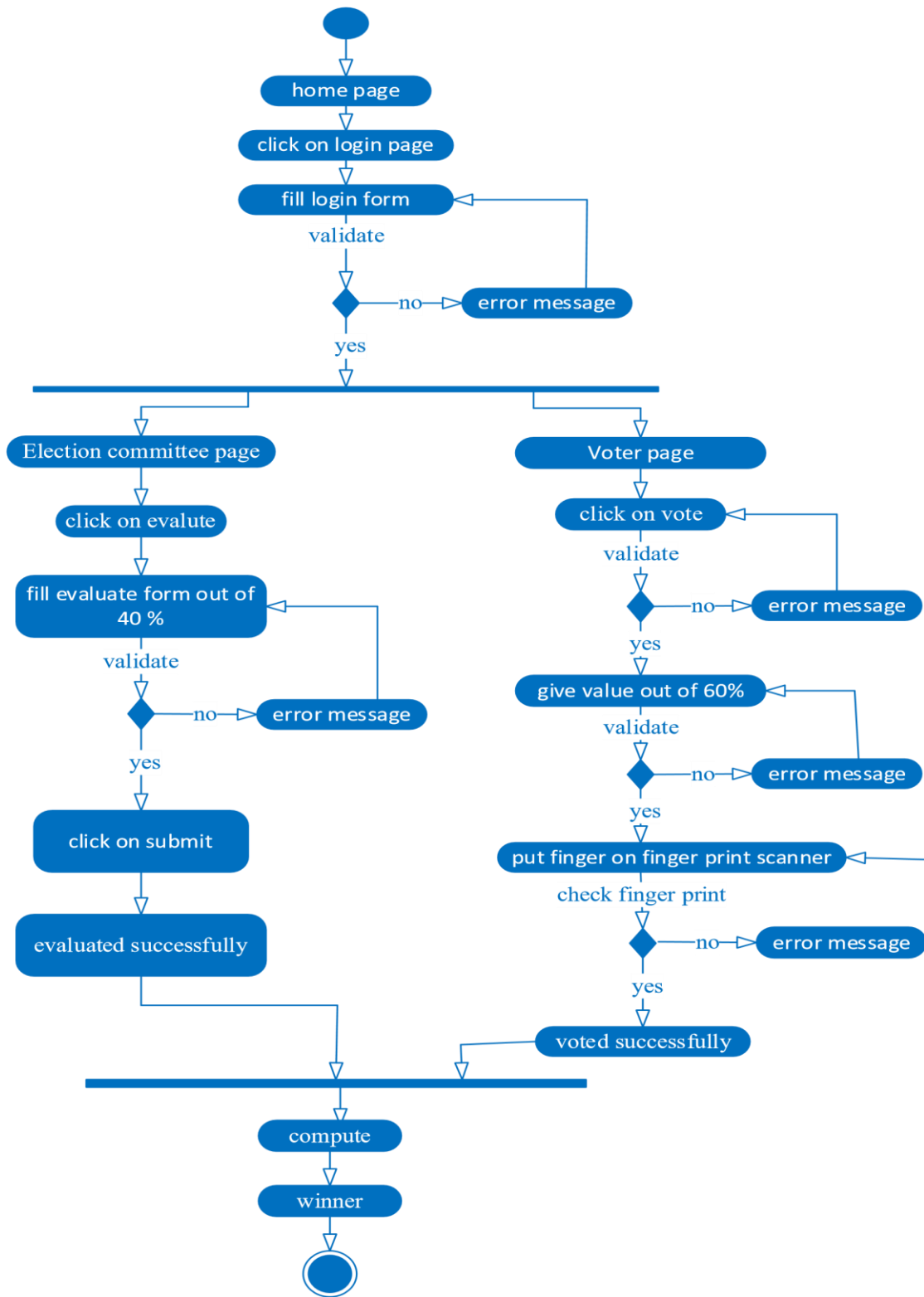


Figure 4. 14 vote activity diagram

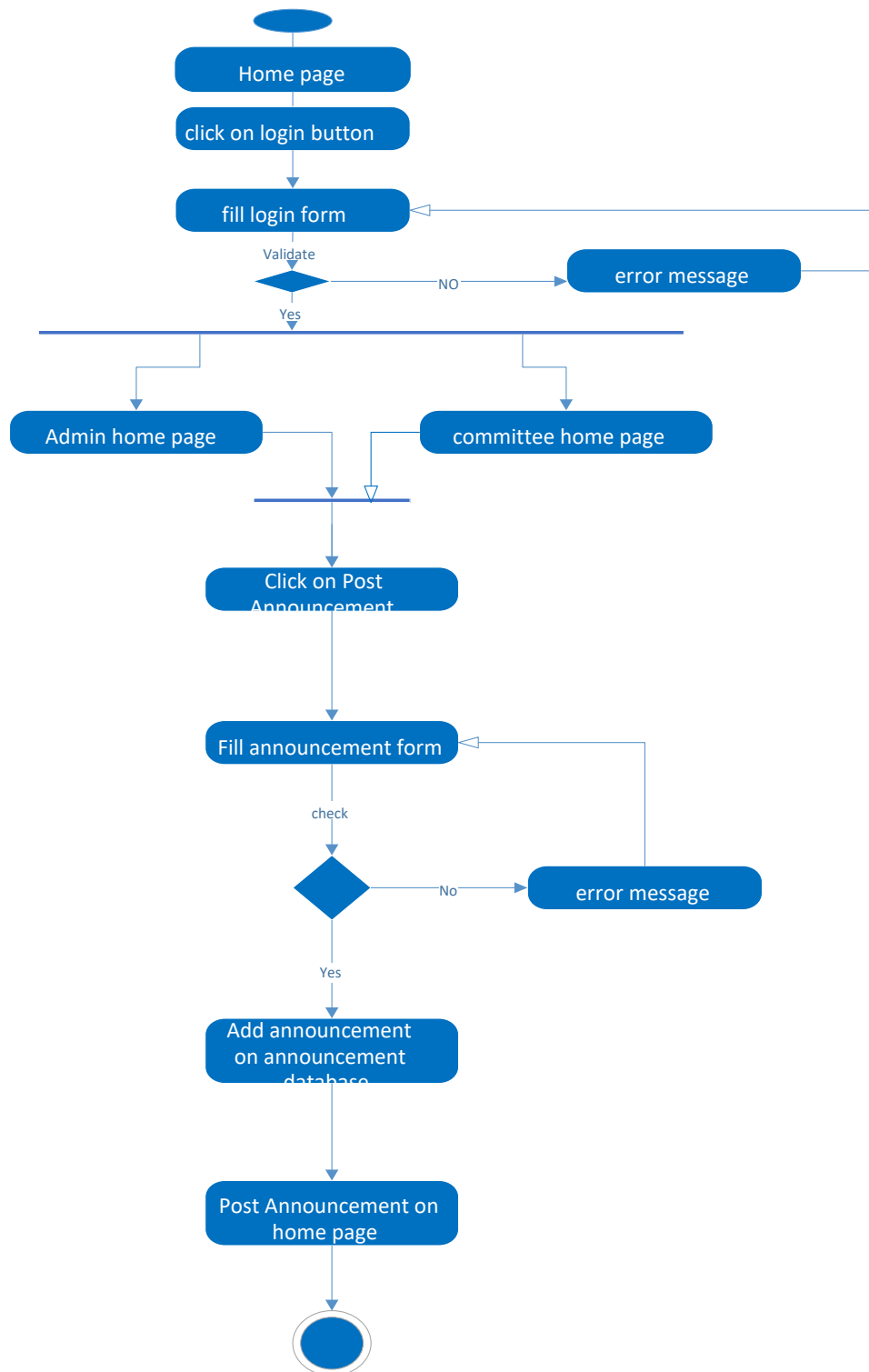


Figure 4. 15 announcement activity diagram

4.5.3 State chart Diagram

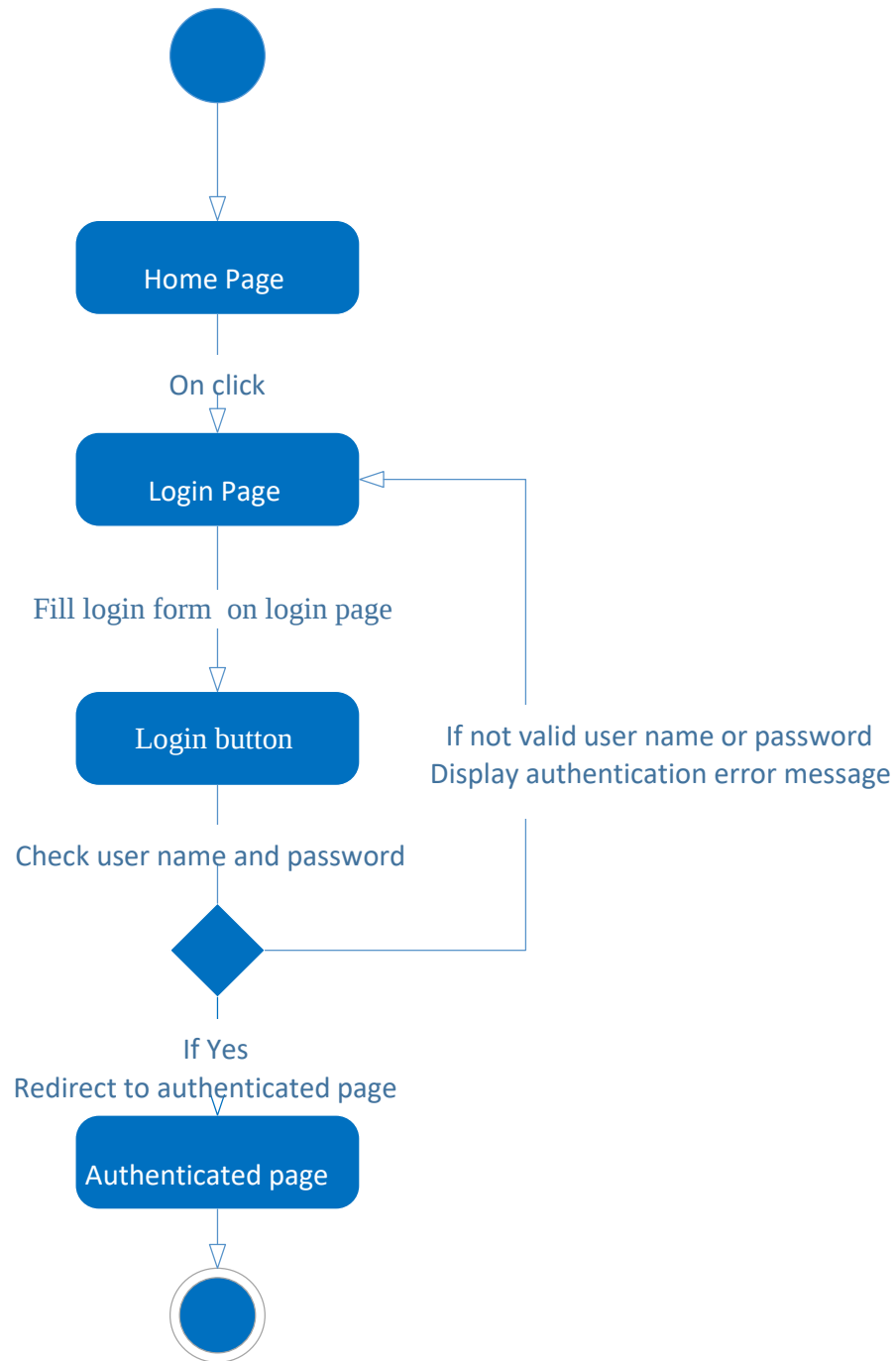


Figure 4. 16 login stat chart diagram

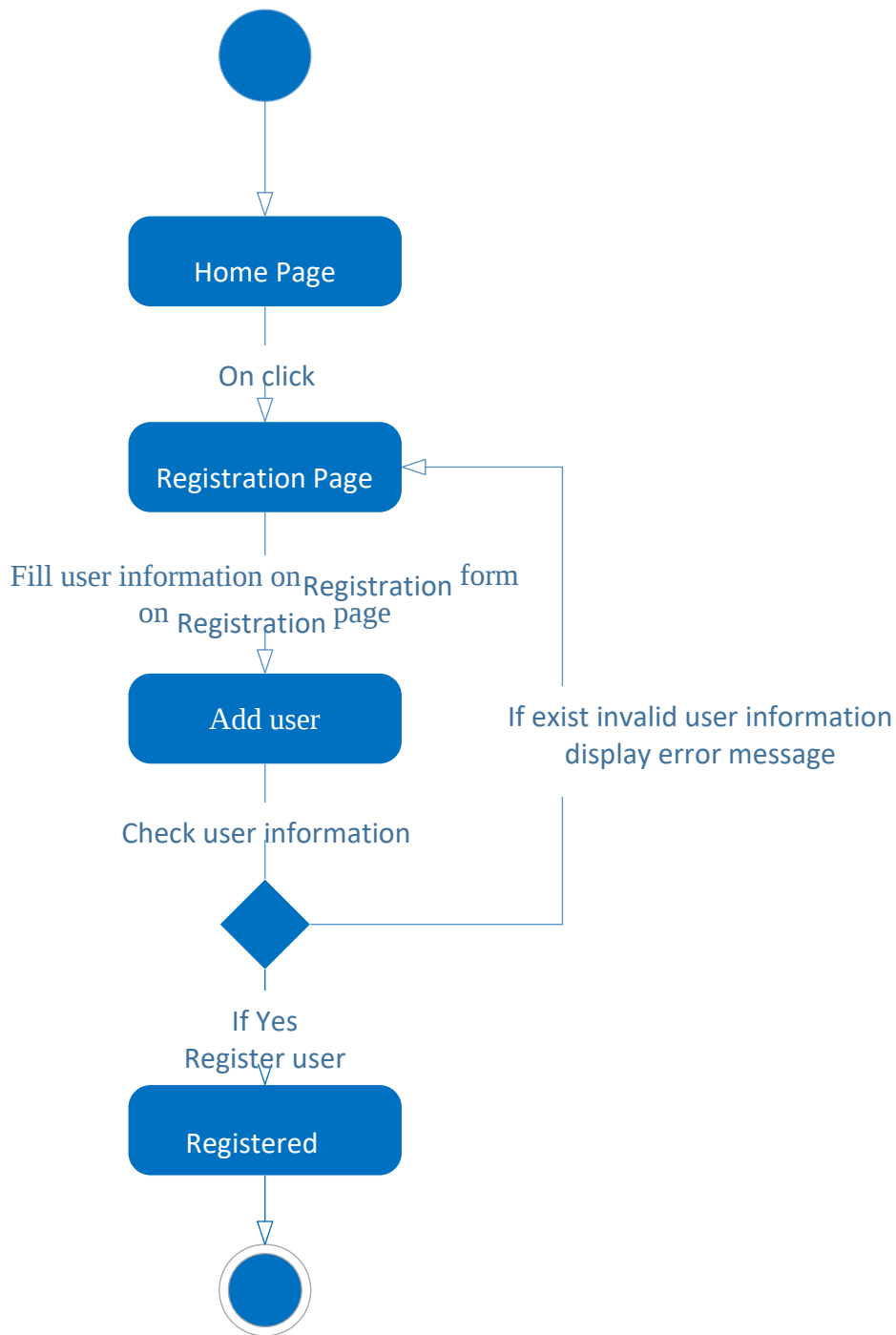


Figure 4. 17 registration state chart diagram

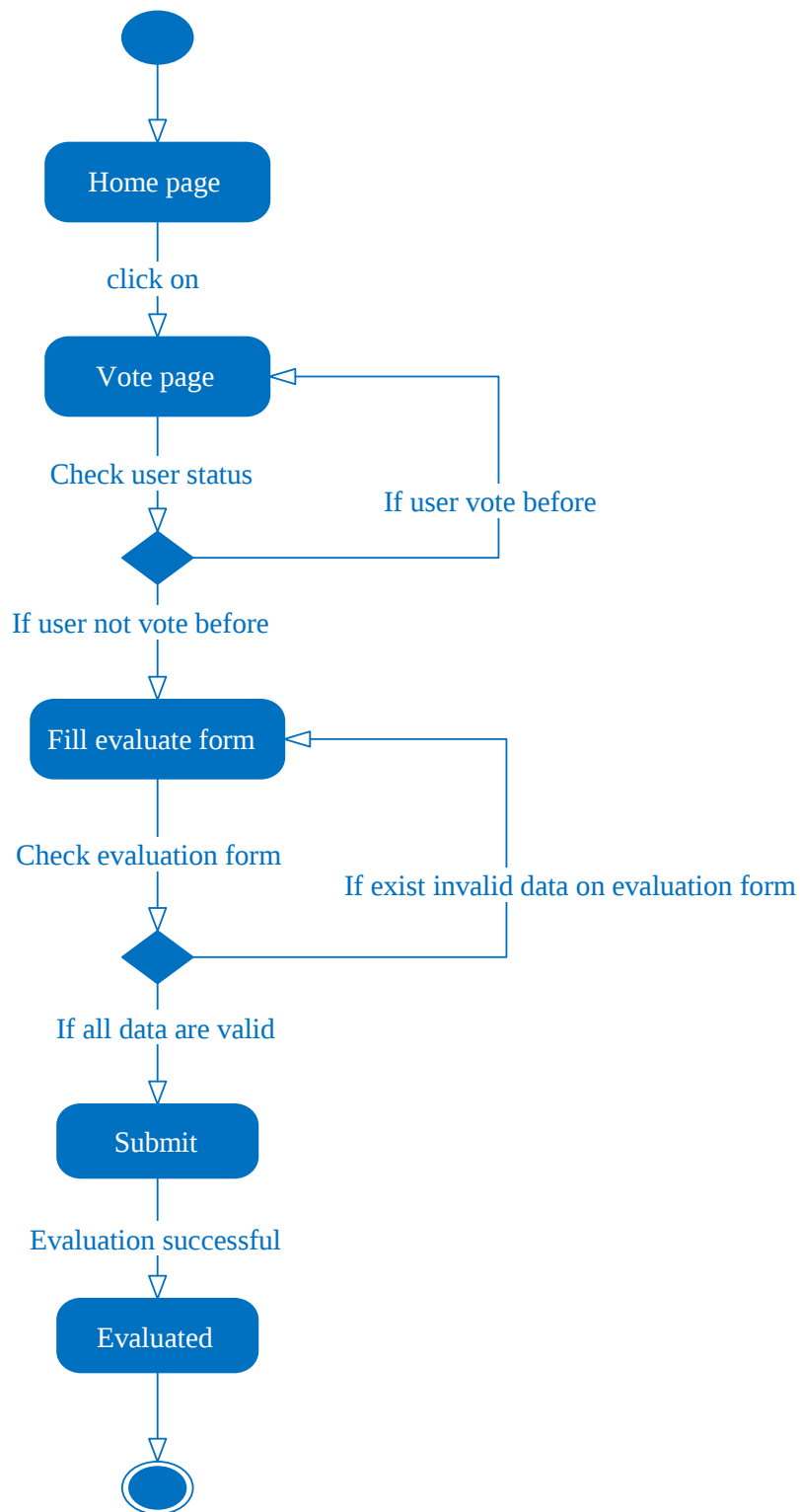


Figure 4. 18 vote state chart diagram

CHAPTER FIVE

5. SYSTEM DESIGN

The purpose of the system design process is to provide sufficient detailed data and information about the system and its system elements to enable the implementation consistent with architectural entities as defined in the model and view of the system architecture. The system provides an optimal solution for the existing system problems. The system is decomposed into different categories reduce system complexity problem when providing solutions for specific problem.

5.1. Design Goals

The goal system design used to manage complexity by dividing the system into smaller and manageable pieces.

User interface and human factor: - the system will have easy and clear user interface (UI). Since the user interface is simple, clear and has clear user guide links and buttons, users who have little computer basic skills or with little training can use the system. In addition to simple and clear usage the system user interface (UI) is more attractive for users and interactive to use the system. Our system has simple and clear guide for users where to click or what to select to perform the desired action.

Hardware consideration: - the hardware requirements of our system are considerably affordable and accessible. The system will use computer devices, cellphones, fingerprint scanner, and deployment servers. These devices are already available. No need of a super computer or complex electronics devices.

Security issue: - the user of our system will be only allowed users. Users must be registered into the system unless and otherwise the system will not allow users for security purposes. Data editing or removing process also performed by only users who has administrative roles. Username and password validation rules also part of the security policies of the system. The system will strongly withstands for malicious attacks.

Performance consideration: - performance of our system will be efficient. The response time and memory requirements are less to perform its tasks. The system will handle as many as possible

users at a time. It required considerable response time. It can provide the desired service within a short period of time.

Error handling and validation: - The systems can able handle exceptions that may happen while user uses the system. It handles exceptions of data duplication to save memory space error related to voting system such as one voter may vote more than one candidate.

Quality issue: - Our system will reliable by handling exceptions when the user uses the system as mentioned before and by performing its function consistently. In the quality assessing the users will be involved by a feedback mechanism in which they can give comments on the system. The system will have no quality issues.

Backup and Recovery:- data backup and recovery is the process of backing up data in the event of a loss and setting up secure systems that allow us to recover data as a result. It requires the copying and achieving of computer data to make it accessible in case of data corruption or deletion. The system will use physical(copy of physical database files that stores database information in another location and forms the foundation of the database recovery mechanism) and logical data (contains the logical data that is extracted from the database and consists of tables, procedures, views and functions) backup and recovery mechanisms.

Physical environment: - The system is deployed on university's main server and any authorized user can access the system by using their own android phone and web browser.

Resource issue:-the resource issue will not be a problem in the system. Users can use the system by using any electronics devices which supports fingerprint and the deployment of the system will be in the WKU server so there will be no resource issue to implement and use the system.

Documentation: - For a system user level document is provided that the user can read the document to know how to use the system and what functionality should the system support to the user. And also, development process is provided that user can read to know about the process and what type of model developer uses to develop the system.

5.2. Current system architecture

The existing system is manual system. Since it is a manual system there is no any architecture for the current system.

5.3. Proposed System Architecture

A software architecture is a description of the subsystems or components of a software system, and the relationship between them. Architecture is the fundamental organization of a system embodied in its components, their relationship to each other, and to the environment, and the principles guiding its design and evolution. The system will use the MVT (Model View Template) architecture. MVT is a software design pattern. It is a collection of three important components Model View and Template.

Model: - it helps to handle database. It is a data access layer which handles the data. A model is a class which is used to contain essential fields and methods and each class maps to a single table in the database.

View: - it is used to execute the business logic and interacts with a model to carry data and renders a template. It is a place where we put our business logic of the application.

Template: - it is a presentation layer which handles User Interface (UI) part completely. A template consists of a static parts of the desired HTML output as well as some special syntax describing how dynamic content will be inserted.

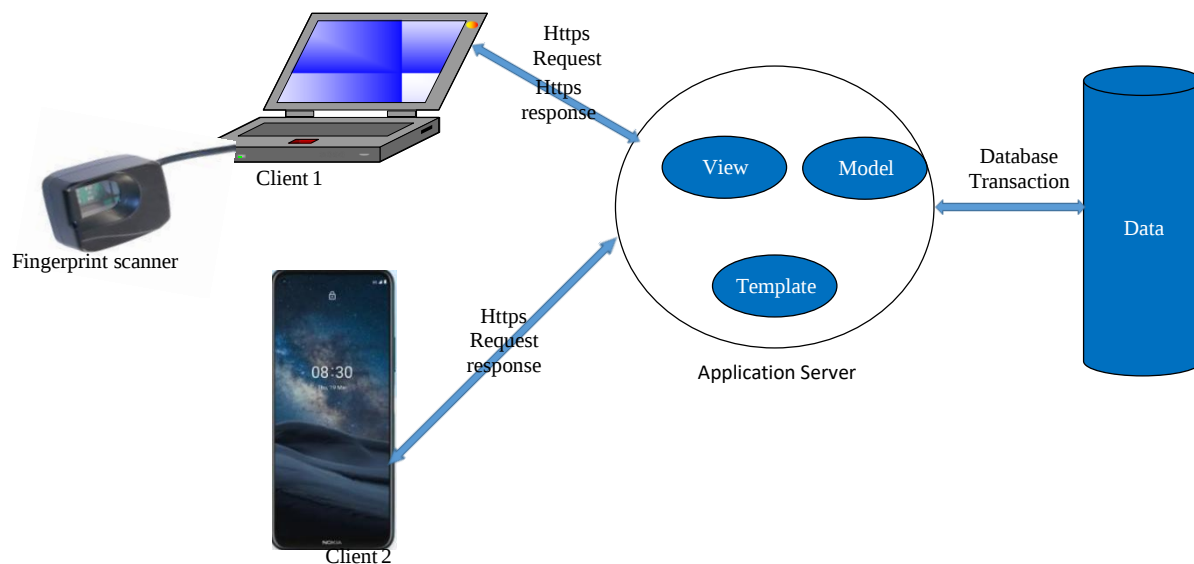


Figure 5. 1 Proposed System Architecture diagram

5.3.1. Subsystem Decomposition and Description

The purpose of this activity is to divide the system in self-contained components that can be managed by individuals. Subsystem composition will help reduce the complexity of the system. The sub systems that we take the classes that our system contain and to distribute the class of the system in to large scale and cohesive components. The following are the major subsystems.

Admin sub system

- Login
- Manage user
- View personal detail
- View announcement

Election committee sub system

- Login
- Manage candidate and voter
- Schedule voting day
- Post announcement
- View announcement
- View personal details
- Receive complain
- Give answer for complain

Candidate sub system

- Login
- View personal details
- Run their presidential campaign
- View announcement
- Report complain

- Take response

Voter sub system

- login
- view personal detail
- finger print recognition
- vote
- view announcement
- report complain

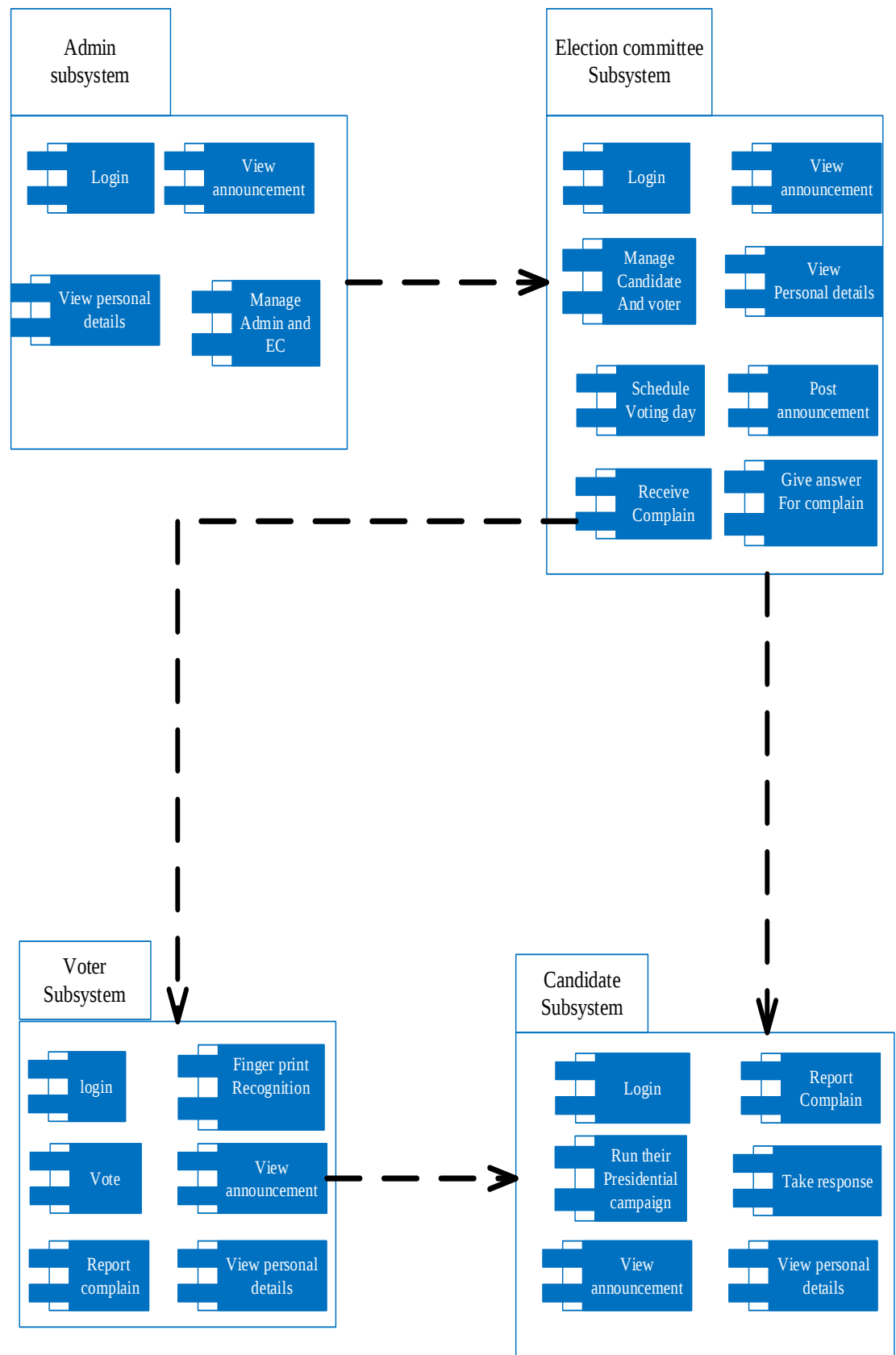


Figure 5. 2 Subsystem Decomposition and Description diagram

5.3.2. Hardware/Software Mapping

The hardware software mapping is described to indicate the various hardware devices and equipment used in the system and its interaction with the software components. It address dependencies and distribution issues of UML components during system design. The deployment diagram shows the hardware for our system, the software that is installed on that hardware, and the middleware administrator. Hardware software mapping shows the software and the hardware components work together. It describes the interconnection of hardware and software how they work and communicate to achieve the desired goals.

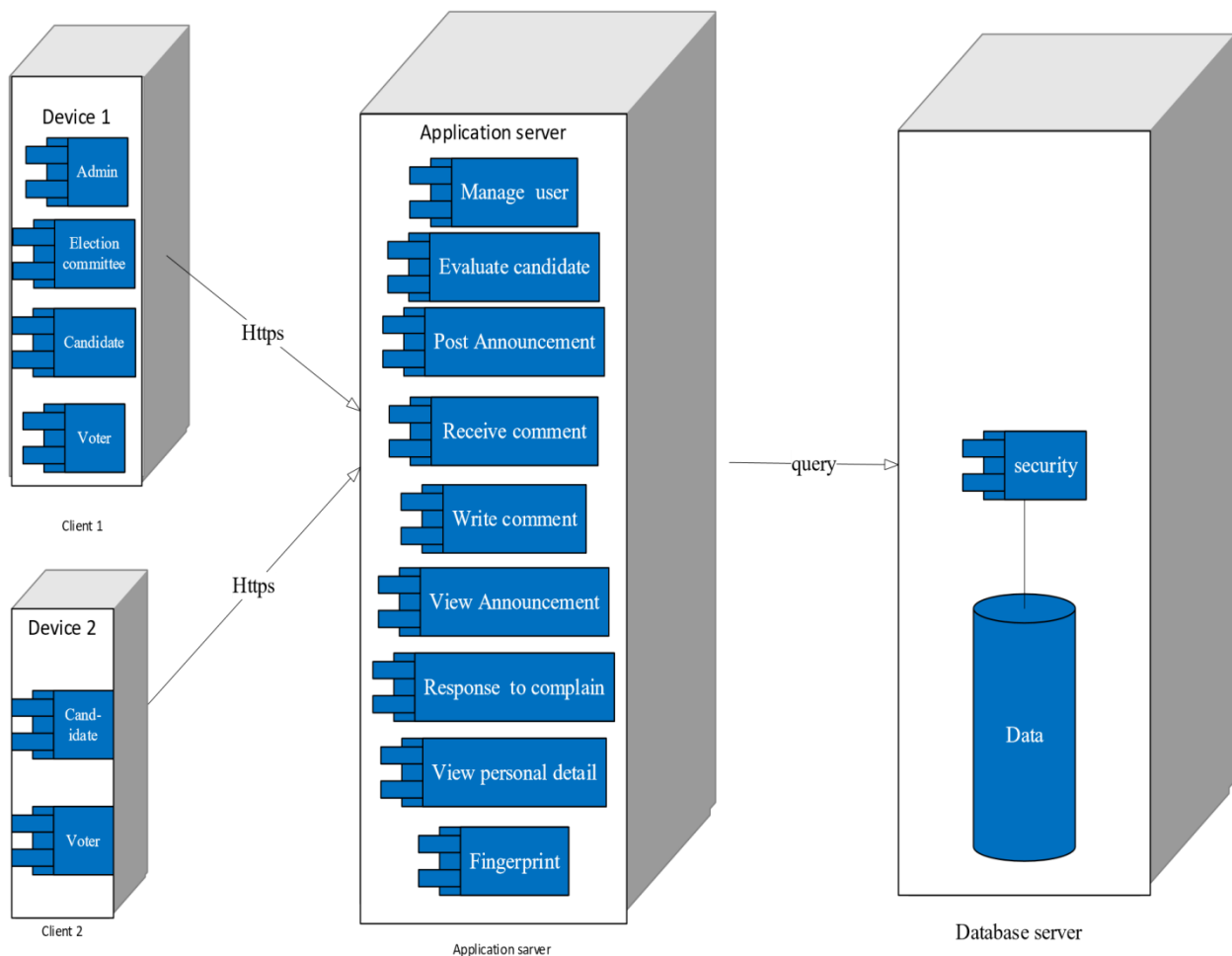


Figure 5. 3 Hardware/Software Mapping diagram

5.3.4. Detailed Class Diagram

A class diagram in the Unified Modeling language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (methods), and the relationships among objects. It is made up of a sets of classes and sets of relationships between classes. The purposes of the detailed class diagram are:-

- To shows static structure of classifiers in a system.
- To provide a basic notation for other structure diagrams prescribed by UML.
- It is helpful for developers and team members too.
- Business Analysts can use class diagrams to model systems from a business perspectives.

This detailed class diagram shows classes, attributes, methods (operations), data types, visibility ((public (+), private (-), protected (#)) of the attributes and methods), inheritances, associations, aggregation, composition, dependencies and multiplicities. Below we use the detailed class UML diagram to show how the aforementioned concepts are organized and designed for better understandings of the system's detailed class diagram.

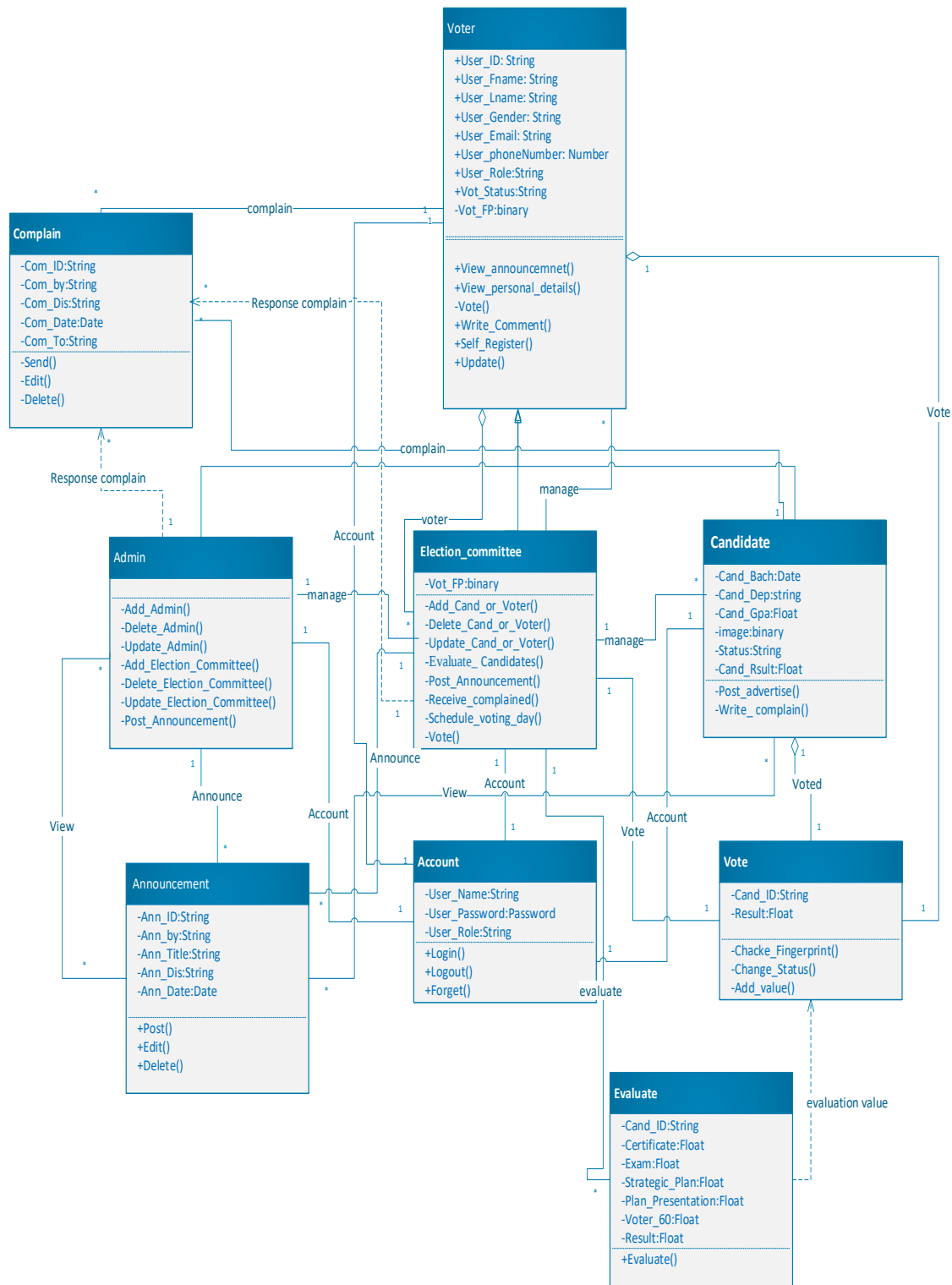
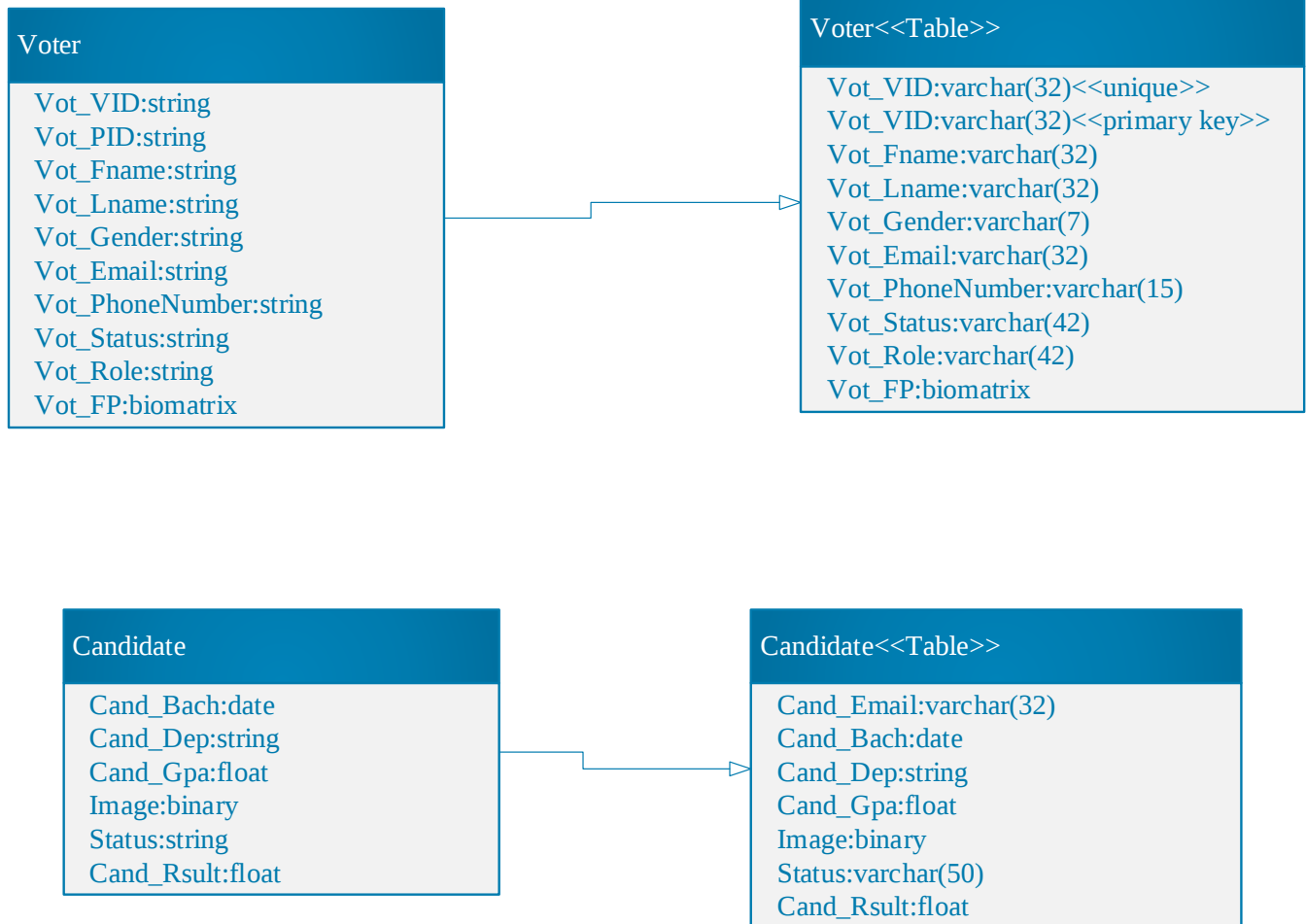


Figure 5. 4 detail class diagram

5.3.5. Persistent Data Management

Persistence data encapsulate the capability to store, retrieve, and delete objects/data permanently. In the current database system we have used different tables as object and each object is related to each other. This schema enables as data manipulation activity such as select, search, delete, update on the database. The following tables indicate the persistence data management of the system.



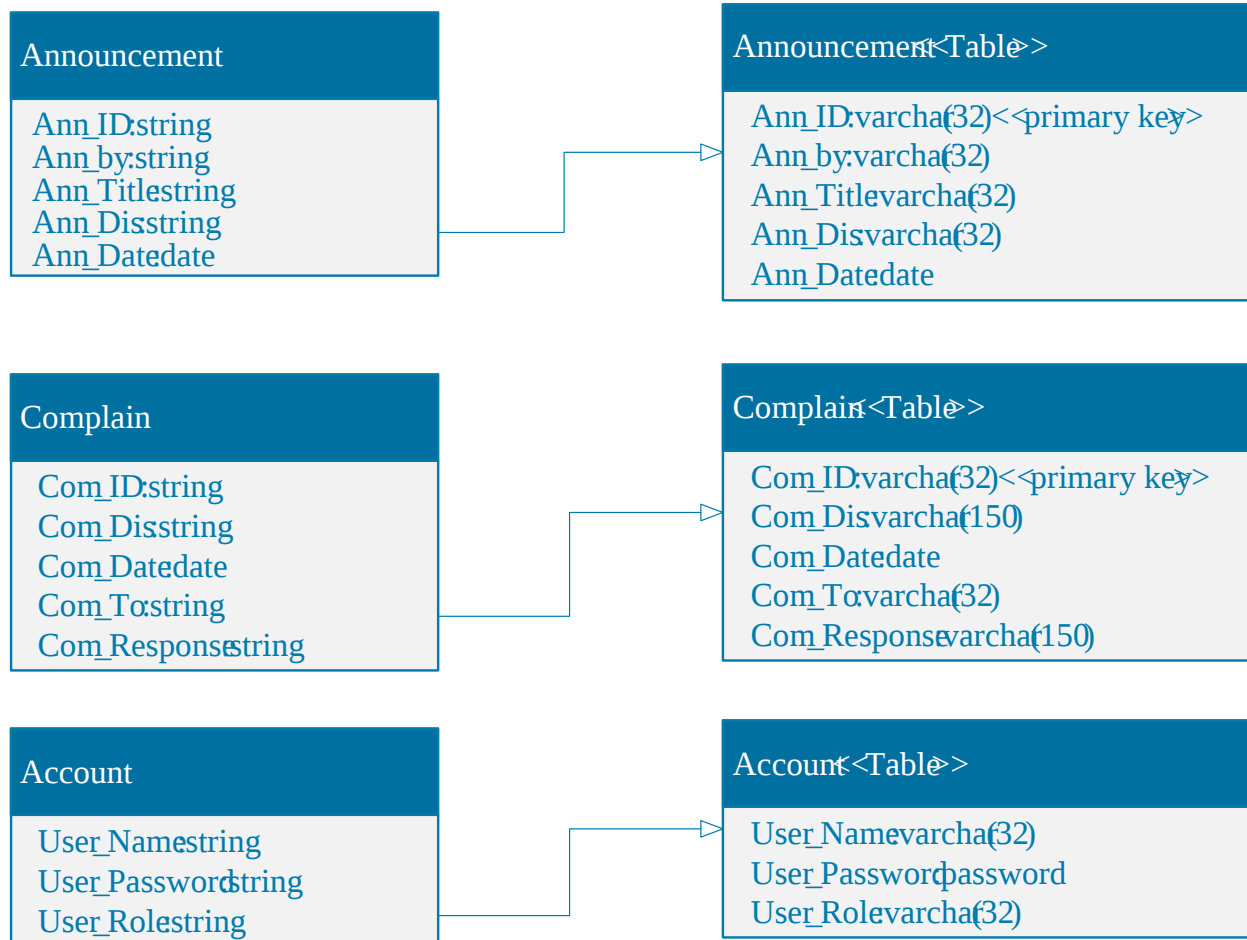


Figure 5. 5 Persistent Data Management diagram

5.3.6. Access Control and Security

In our system, different actors have access to different information and data. Access control and security specify what the user can access or what cannot perform by some users. This access control is verified by a username and password. The system admin represents an authenticated user. The system follows multi-user system. In multi-user system, different actors have access to different functionality and data. Then it must be having: -

Confidentiality: - Only authorized persons can see the information. Private data is kept private, personal privacy is respected.

Table 5. 1 Access Control and Security table

Actor	Operation					
	Registration	Vote	Evaluation	comment	Announcement	advertisement
Administrator	CRUD	-----	-----	CRUD	CRUD	R
Election committee	CRUD	-----	CRU	CRUD	CRUD	R
Voter	CRUD	CRU	-----	CRUD	R	R
Candidate	CRUD	R	R	CRUD	R	CRUD

5.4. Packages

Package diagram is a kind of structural diagram that shows the arrangement and organization of model elements in the system. It can show both structure and dependencies between sub-systems or modules and shows the different views of a system. We use package diagram to structure high level system elements and organized the large system into sub-modules. We use packages in the system:-

- To simplify complex class diagram into classes package groups.
- To group logically related UML elements.

- To depict file folders and used on any of the UML diagrams.

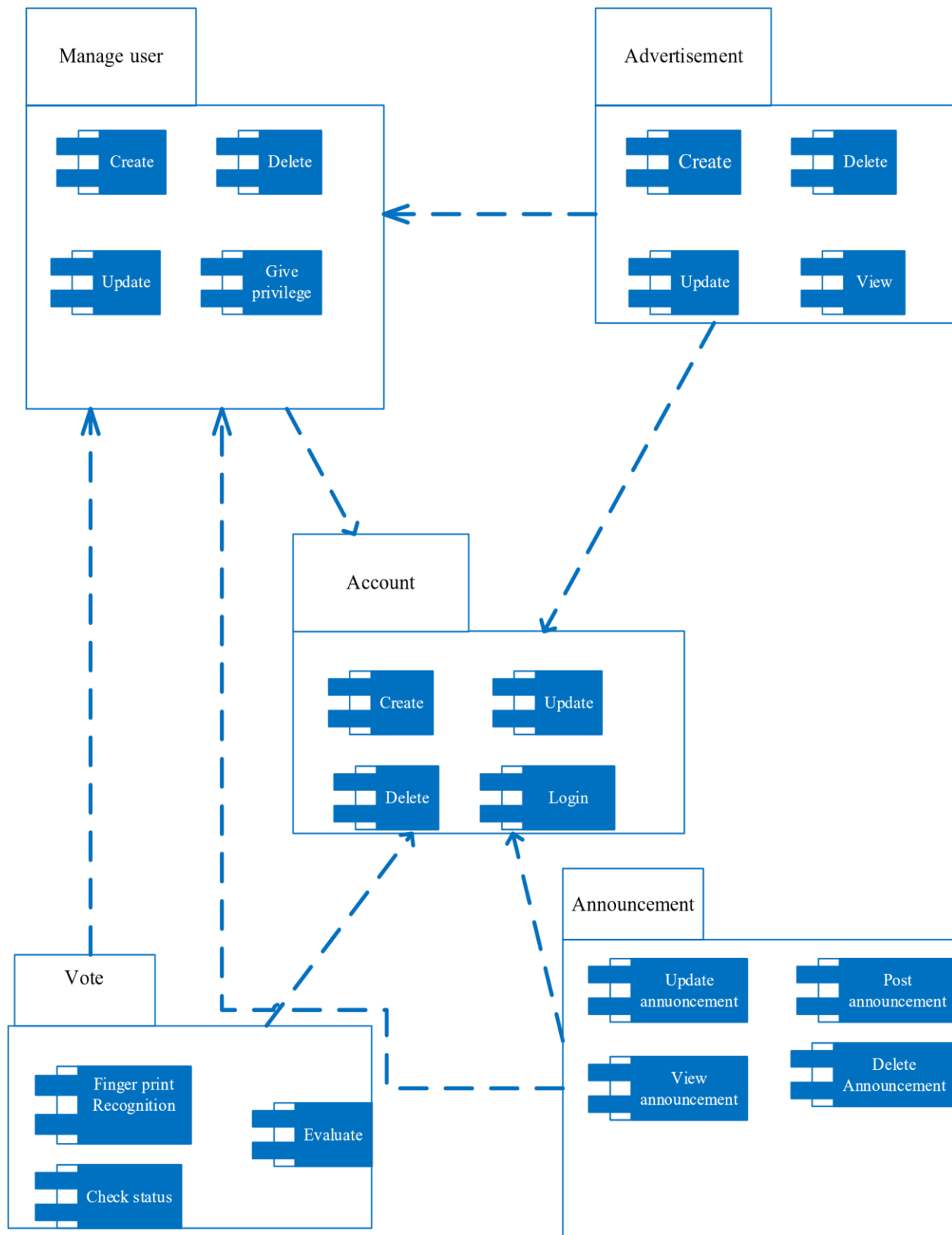


Figure 5. 6 Packages diagram

5.5. Algorithm Design

Pseudo code is a compact and informal high-level description of a computer programming algorithm that uses the structural conventions of a programming language but is intended for human reading rather than machine reading. The purpose of using pseudocode is that it is easier for humans to understand than conventional programming language code and that it is a compact and environment independent description of the key principles of an algorithm.

Algorithm use for login

Begin

If (user click the Login button)

 Fill Login Form

 If (valid)

 Redirect to authenticated page

 Allow to perform privileged task

 Else

 Display error message.

 Redirect to login page

 Ask the user to refill the form

 End if

End if

End

Algorithm use for Vote

Begin

 If user click on vote button

 If (user is Election committee and not evaluate before)

 Fill evaluation form from 40%

 If valid

 Evaluate successfully

 Else

 Redirect to election committee evaluation form

 End if

 If (user is voter and not vote before)

 Fill evolution form from 60%

 If valid

 If fingerprint is valid

 Evaluate successfully

 Else

 Display error message

 Redirect to home page

 End if

 End if

 End if

 End if

End

5.6. User Interface Design

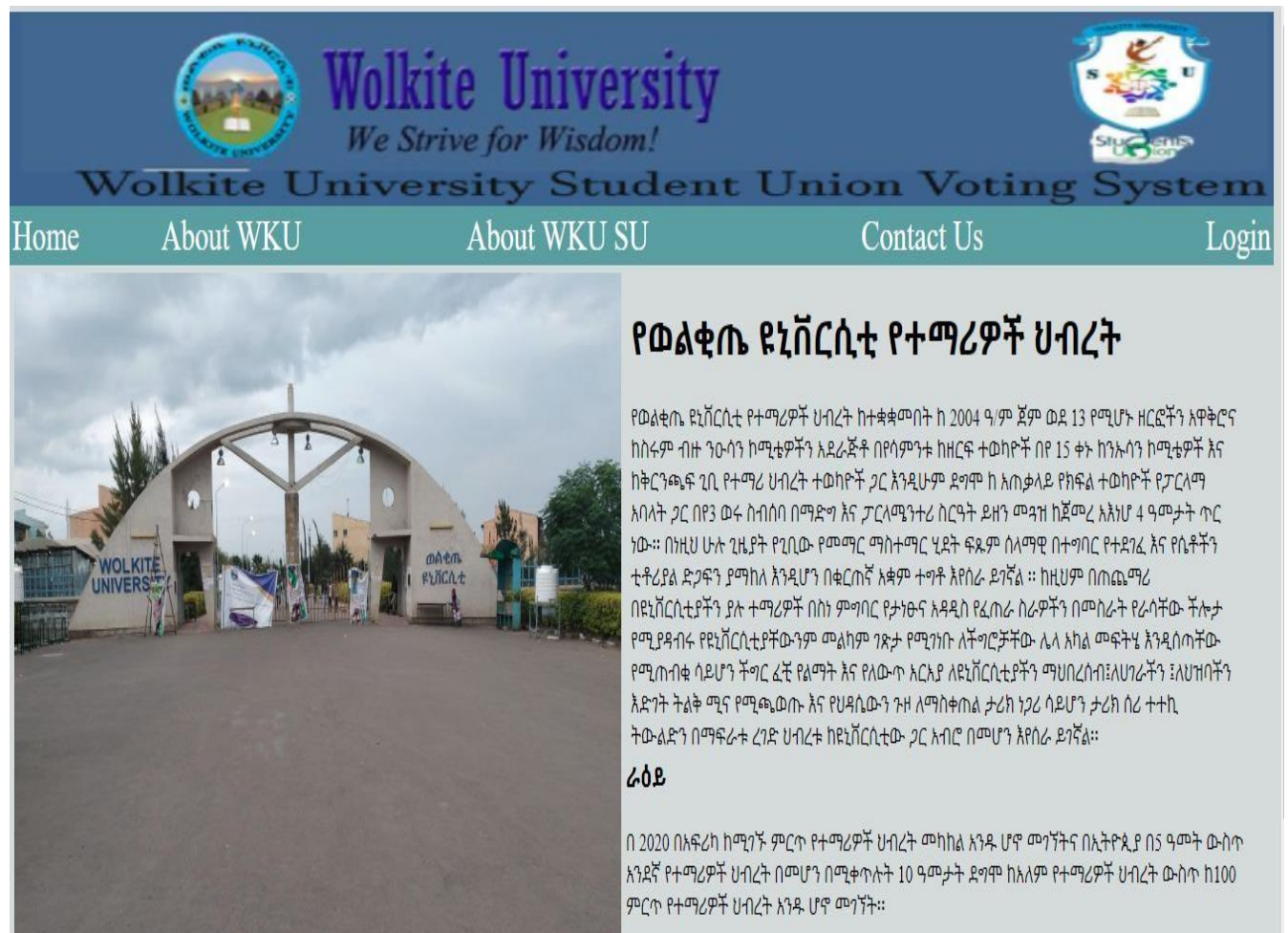


Figure 5. 7 Home Page User Interface Design



Wolkite University
We Strive for Wisdom!



Wolkite University Student Union Voting System

Home About WKU About WKU SU Contact Us Login

LOGIN

Please enter your login and password!

[Forgot password?](#)

Figure 5. 8 Login Page User Interface Design

CHAPTER SIX

6. IMPLEMENTATION AND TESTING

6.1. Implementation of the Database

In this project PostgreSQL database management system used for the implementation of the database. Because PostgreSQL is an advanced open-source object-relational system which applies SQL language. It allows to store large and sophisticated data safely and help developers to build the most complex applications, run administrative tasks and create integral environments. It is more secure, cheap and scalable.

Using PostgreSQL database management system helped us to perform the following activities:

- We created all tables which were identified and shown as persistent model in the design document with their primary keys, foreign keys, check constraints and unique constraints.
- We configured a schedule of database backup aromatically in every week.
- we take appropriate level of security to our data base

6.2. Implementation of the class diagram

The implementation of the system is based on the design of the class diagram and the business logic with the targeted programing language. The attributes are properly defined with their data types and access visibilities (modifiers). Methods are also defined appropriately with their return types, parameters, and data types including access visibility. The document of this project is well organized and documented based on the document design.

6.3. Configuration of the application server

In this project, Django is used as an application server because it is a free, open-source framework and for the purpose of developmental speed and performance as well as for security purposes. It offers interactive shortcuts for full integration with the system databases.

- Folders and files are properly organized.
- The application server properly starts and shutdowns.
- Its configuration enables the remote access of the system.

6.4. Configuration of application security

The configuration of application security server is well handled for the security purposes. Security issues are handled properly.

- All input validations are implemented properly.
- Encryption and decryption algorithms are implemented properly for sensitive data.
- User's roles are handled properly for accessing the system.
- User's accounts are assigned with necessary access privileges.
- Functional requirements are described well and checked.
- Session and cookies are also implemented in this system properly.

6.5. Implementation of user interface

The user interface of this system is implemented based on the design. It is clear and interactive; as much as possible complexity is handled in this user interface.

- It reduces memory loads of the users.
- It is consistent and interactive.
- It is easy and clear to use.

6.6. Testing the system

The functionality of the developed system must be tested because it has to provide its intended goal or functions. The following features are tested:-

- Input and output function
- Subsystem communication
- Database and application server communication
- Databases and user interface interactions
- Graphical user interface.
- Validations and authentication
- Security mechanisms also tested in this system.

6.6.1. Test Case

Sample Test Cases

Registration Form having following fields:-

- Username
- First Name
- Last Name
- Email
- Phone Number
- Gender
- Role

Required fields are: - All fields

Table: - Test case to create an account

Test Case1: check user registration and approval
Test case objective : To create account
Test case description: first any user enters basic info of the user, then presses register button. Client program validate appropriate client side validation and contacts with server, server contacts with the database, and database checks for registration and if use is registered successfully the system asks for approval of registered user. If user is registered and approved then user can create his/her own account by using registered Email and username.
Requirements Verified: Yes
Test Environment: PostgreSQL and Django server must be in running state, Database Should contain appropriate table and link must be established between server and client program

6.6.2. Testing tools and Environments

In this project different testing tools are used for testing the system development process progress and for debugging purposes.

Software testing tools

- Window 10 operating system.
- Android operating system.
- Web browsers (Chrome, Microsoft edge).

Hardware testing tools

- Computer(Dell desktop, HP laptop)
- Mobile phone(Samsung)
- Fingerprint scanner devices (ZKTeco TX-628 Fingerprint Attendance System).
- Internet cable

6.6.3. Unit testing

We unit testing at the coding level to test the methods' functional correctness of the independent modules, the unit testing technique was used. We used it to isolate a section of codes, verify the correctness of the code, the functions and procedures of the system, to fix debug in development cycle and helped us to understand the code base, reuse code, and enable us to make quick changes. Generally, we used a unit test to correct code errors at the right time.

6.6.4. System testing

We applied System testing at high-level design to ensure the functional and non-functional requirements' correctness, performance, accuracy, functionality validations, and security have been met correctly. We tested the complete and fully integrated software product. We examined how the whole subsystems work together to achieve the desired goal of the user's requirements from the system.

6.6.5. Integration testing

At low-level design, we used integration testing to examine how the different procedures work together to achieve the goal of the system. Check the interaction between individual functionality which performs the specific task. All the screens functions, stores data tables, and other modules were connected with seamless interfacing. All the required outputs were produced successfully as expected from the systems and inputs were validated and stored in the correct formats. In this second level testing technique, we tested the interfacing issues between the modules and we make sure that this project has no interfacing issues between the related modules.

6.6.6. Acceptance testing

We used acceptance testing to determine whether or not the software system has met the required specifications. We used it to evaluate the system's compliance with the business required and verify if it has met the required criteria for delivery to end-users. This system is ready for end-users because we tested it based on the following acceptance testing criteria.

- Its functionally correct and complete.
- It is usable.
- Data integrity and confidentiality are ensured.
- Scalable and available.
- Has high performance and security.
- It is well documented.

CHAPTER SEVEN

7. CONCLUSION AND RECOMMENDATION

7.1. Conclusion

Currently WKU student union using a manual-based voting system. this manual election process has so many drawbacks such as one voter may vote more than one candidate at a time, one voter may add more than one card to one candidate, may unauthorized voter votes, time and resource consuming, data retrieving is hard, insecure, and others. So in order to solve the aforementioned problem we have developed a fingerprint-based voting system for the WKU student union president vote.

7.2. Recommendation

According to the scope of our project, the team develops web and mobile-based applications. Because of the time constraint, we may have limitations that should be a consideration, but in the future, the team believes that this system should be fully operational by adding some functionality that is not included in the system. We also want to recommend this project can be expanded and more automated with additional functionalities by integrating with many new technologies. We recommended for future studies customize and update the system to be functional for the National level election process and to be computable with electronics devices which has no fingerprint scanner.

Reference

- [1] Megawati, "Student Union structure and election guideline," *Int. J. Physiol.*, vol. 6, no. 1, p. 2018, 2018.
- [2] U. C. Ltd., "What is a Student Union." <https://universitycompare.com/advice/student/student-union/>.
- [3] "voting sytem all1-Copy.pdf." .
- [4] "system development model," [Online]. Available: <https://airbrake.io/blog/sdlc/iterative-model>.
- [5] "system testing methodology," [Online]. Available: <https://www.guru99.com/unit-testing-guide.html>, <https://www.toptal.com/qa/how-to-write-testable-code-and-why-it-matters> .
- [6] "Systems Analysis." https://www.tutorialspoint.com/system_analysis_and_design/system_analysis_and_design_overview.htm.
- [7] E. Birhanu, C. Science, W. Muluye, S. Engineering, Z. Mulugeta, and C. Science, "WOLKITE UNIVERSITY COLLEGE OF COMPUTING AND INFORMATICS Industrial Project Guideline Version 2," 2019.
- [8] "System Modeling," [Online]. Available: <https://cs.ccsu.edu/~stan/classes/CS410/Notes16/05-SystemModeling.html>.
- [9] "Use-Case Model," [Online]. Available: https://www.utm.mx/~caff/doc/OpenUPWeb/openup/guidances/concepts/use_case_model_CD178AF9.html.